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THE JOURNAL OF PEDIATRICS

A MONTHLY JOURNAL DEVOTED TO THE PROBLEMS AND DISEASES OF INFANCY AND CHILDHOOD

Official Organ for
THE AMERICAN ACADEMY OF PEDIATRICS

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Dextri-Maltose, Carbohydrate of Choice

"As to the kind of extra carbohydrate to be added, whether lactose or maltose, I believe dextrimaltose to be better in general in cases of fat indigestion (infantile atrophy)."—*C. H. Dunn: The Hygienic and Medical Treatment of Children, Southworth Co., Troy, New York, 1917, V. I, p. 418.*

In discussing the treatment of decomposition, Feer says: "The period of repair may be shortened by giving suitable additional food; the best, probably, being buttermilk to which carefully regulated proportions of dextrin and maltose preparations or malt soup are added."—*E. Feer: Text-Book of Pediatrics, J. B. Lippincott Co., Phila., 1922, p. 284.*

In the treatment of infantile atrophy, Fischer recommends the following: "The carbohydrate should be increased by gradual addition of dextrimaltose.

"Malt soup or dextrimaltose (Mead's) should be added in teaspoonful or more doses to each feeding until the point of carbohydrate tolerance is reached."—*L. Fischer: Diseases of Infancy and Childhood, F. A. Davis Co., Phila., 1925, V. I, p. 285.*

Grulee, discussing treatment of decomposition, observes: "As a rule it is best to start with 2 to 2½ or 3 ounces of albumin milk to the pound weight in 24 hours; the sugar to be added is in the form of a maltose-dextrin mixture. One should never delay too long in adding this."—*C. G. Grulee: Infant Feeding, W. B. Saunders Co., Phila., 1922, p. 265.*

Referring to the hypotrophic infant, Herrman writes: "In mild cases, the addition of dextrimaltose instead of cane or milk sugar may be sufficient to obtain a gain in weight."—*C. Herrman: The treatment of nutritional disorders in artificially-fed infants, New York M. J. 114:158-160, August, 1921.*

In discussing artificial feeding in athrepsia, Hess states: "The carbohydrates are usually added in a slowly fermentable form, such as the maltose and dextrin compounds, which are usually started by the addition of four grams per kilogram (1/15 ounce per pound) and increased until eight grams or more per kilogram (¼ ounce per pound) of body weight are added."—*J. H. Hess: Feeding and the Nutritional Disorders in Infancy and Childhood, F. A. Davis Co., Phila., 1928, p. 278.*

Concerning the treatment of marasmus, Hill says: "When the stools have become smooth and salve-like, carbohydrate, in the form of dextrimaltose, may be gradually added up to the limit of tolerance."—*L. W. Hill: Practical Infant Feeding, W. B. Saunders Co., Phila., 1922, p. 281.*

"A spasmophilic baby on bottle feeding should receive a limited amount of milk—a pint, or at the most 24 ounces in the 24 hours—to which cereal gruel and some form of sugar is added, preferably one of the malt dextrin preparations; also the early addition of other foods than milk to the baby's diet."—*M. Jampolis: Infantile spasmophilia, Interstate M. J. 25:652, Sept., 1918; abst. Arch. Pediat. 35:691, Nov. 1918.*

With reference to the treatment of diarrhea, Lust writes: "After several days, 2% to 3% of a maltose-dextrin preparation may be added (Dextri-Maltose). This is preferable to the easily fermentable lactose or cane sugar."—*F. Lust: The Treatment of Children's Diseases, J. P. Lippincott Co., Phila., 1930, p. 145.*

"The treatment of artificially fed children in the first of these groups consists in putting them on a low fat dietary, and giving them carbohydrate in the form of one of the less fermentable sugars—e.g., dextrimaltose."—*L. G. Parsons: Wasting disorders of early infancy, Lancet, 1:687-694, April 5, 1924.*

Pearson and Wyllie in discussing the treatment of milder cases of inanition say: "Regulation of this disturbed organismal balance is obtained by the addition of carbohydrates, while fat and casein are reduced. For this purpose dextrimaltose and flour are better than the ordinary sugars, since they are more slowly absorbed and have greater efficacy in their powers of controlling the flora in the large intestine."—*W. J. Pearson, and W. G. Wyllie: Recent Advances in Diseases of Children, P. Blakiston's Son & Co., Phila., 1930, p. 116.*

Regarding the treatment of the marantic infant, Raue states: "After the intolerance to sugar has been overcome a carbohydrate, preferably Dextrimaltose, may be added."—*C. S. Raue: Diseases of Children, Boericke & Tafel, Phila., 1922, p. 427.*

In discussing the treatment of atrophy, Thursfield and Paterson, state: "If the baby continues to improve, the next step in the treatment is to add to the milk one of the less fermentable carbohydrates, such as dextrimaltose; . . ."—*H. Thursfield, and D. Paterson: Diseases of Children, William Wood & Co., 1929, p. 105.*

"I also find dextrin-maltose an excellent addition to albumin-milk when the first object of that food has been achieved and a gain in weight is desired; in this way I have succeeded in feeding albumin-milk far beyond the period usually advised, with highly gratifying results."—*F. L. Wachenheim: Infant-Feeding; Its Principles and Practice, Lea & Febiger, Phila., 1915, p. 158.*

"Dextri-maltose has been substituted for lactose not infrequently, when the tolerance for the latter continues low."—*J. H. West: Low fat, high starch evaporated milk feeding for the marasmic baby, Arch. Pediat. 48:189-193, March, 1931.*

"Malt sugar is indicated when others fail to produce a sufficient gain, or when malassimilation of fat is evident."—*O. H. Wilson: The role of carbohydrates in infant feeding, Southern M. J. 11:177, March, 1918; abst. Arch. Pediat. 35:447, July, 1918.*

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The Journal of Pediatrics

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Original Communications

TRENDS IN PEDIATRICS

PRESIDENTIAL ADDRESS, AMERICAN ACADEMY OF PEDIATRICS

JOHN RUHRÄH, M.D.
BALTIMORE, MD.

YOU must permit me to express my thanks and appreciation for the honor which you have conferred upon me in making me your president this year. As I remarked on taking office, my predecessors owed their selection to certain outstanding achievements in pediatrics, while it seems to me that my being chosen depended largely on my having good friends on the nominating committee or on the fact that last year was a good year for "polio" presidents.

My predecessors devoted large portions of their addresses to a consideration of the aims and needs of the Academy, but now owing to their labors and those of our efficient secretary there is not as much need for this as there was and I may call your attention to some other things which I think at once of interest and importance. These thoughts I have grouped under the heading of Trends in Pediatrics.

Our knowledge of the diseases of children, their prevention and management has been the matter of slow growth during the past ages of which we have any record. Folklore, popular superstitions, and a certain amount of crude clinical experience furnished the first pediatric literature. From time to time some brilliant and observing mind added clinical facts of great importance. Hippocrates in his Aphorisms and in his description of mumps in Thasos and of epidemic paraplegia are a good example of this and Soranus of Ephesus, with his incomparable treatise on the diseases of infants, is another.

Apart from these occasional flashes of genius, which for the most part made little or no impression on the actual practice of medicine as it applied to children, pediatrics like medicine just drifted or, shall we

Presented at the Fourth Annual Meeting of the Academy of Pediatrics, Cleveland, Ohio, June 11, 1934.

say, flowed willy-nilly here and there and the professional interest in the early days, as now, was largely a reflection of what was uppermost in the lay mind.

What is meant by pediatric trends is, perhaps, best illustrated by a simile, an almost allegorical one. We can imagine the knowledge of pediatrics as a flood of water, moving like a river through the varied panorama of the ages, no two eras of which are alike, but there are in all certain general similarities. The physicians who have interested themselves in pediatrics are like mariners voyaging for a brief period on this flood and their books and writings may be likened to the stories of travelers who have set down an account of their wanderings and deeds. Each one of these hardy explorers finds a new spring and releases a pent-up rivulet of water which, mingling with the current, increases its volume; sometimes it is a stream of crystal beauty and other times only a muddy flow which clouds the flood. Alas, too many of the contributions have done this, but fortunately this mud quickly sinks to the bottom and does only temporary harm or else is forgotten long since unless some curious searcher delves in the detritus of the past. Still some of it may cling as tenaciously as viscid mucus. Only recently a physician of nation-wide notoriety wrote in one of his books that smallpox, eczema, and other skin eruptions were only evidence of nature getting rid of an impurity, an idea hoary with age.

The old mariners, like those of today, each must build a ship. The primitive pediatrists fashioned crude vessels, and their counterpart is seen in the household and quack medicine of today, and this not confined to out-of-the-way localities but is just as prevalent in cities and among those whose education should make them know better. From these crude beginnings of small unhandy vessels sailed in tiny rivulets of very muddy water, there gradually emerged bigger and better ones traversing an ever increasing stream of pediatric knowledge, flowing always, as it always will and must, with the general current of medicine, but to the seeing eye and understanding brain as distinct and separate as the gulf stream in the ocean.

Rarely does the mariner build an entirely new vessel; most often he takes an old one and puts in a few patches of his own and finally thinks the whole thing is his own creation. But the bystander sees only a conglomeration from many previous vessels, pieces of bronze and copper from the ancient days as good as when they were fashioned. Here a bit of carving from some old oriental ship, here a bit from ancient Egypt, something from Alexandria, much from Greece, all molded and fitted together. And later on someone will wreck this vessel, and others seize the most durable and imperishable bits and so on until we reach our present day, with its magnificent vessels, full of ingenious instruments

to aid navigation and make it easy. But these vessels sail the same waters, charted better indeed, but still a flood flowing into the unknown ages to come.

Many contributors have released clear limpid streams like those set free by Hippocrates, by Soranus, by Aretaeus, or by Archigenes. But it must be borne in mind that each contributor, while he added to the stream of knowledge, did little to change its direction. It flowed on and on like water, taking the way of least resistance and colored and altered by the country through which it passed. As the age varied, so varied pediatric thought. This is the important thing. The contributor reflected the age he lived in, the prevailing philosophy of his time. If Hippocrates saw clearly and wrote scientifically, it was because it was the fashion of the Greeks of his time to do so. He may have excelled his brothers in skill and technic, but had he lived in a different age it is to be doubted if he would have written as he did.

It has been said that Galen spoke and medicine stood still a thousand years. It did not stand still because of Galen, but because the stream of medical knowledge had flowed into the great intellectual swamp of the so-called dark ages when men's minds were turned to other things than knowledge. It was an age highly colored by the church and St. Jerome was preaching, "He who has been bathed in the blood of Christ need never bathe again." The people of that age took him literally. Imagine trying to launch an infant welfare campaign when filth was a badge of piety and disease and plagues were regarded as scourges sent by the Almighty in punishment for the sins of His people. It would have taken a hardy man, nay a foolhardy one, to have tried to persuade these people that plagues could be stopped by killing rats and vermin. It would have been impious to have interfered in such a manner. If it was the will of God, then what was needed was prayer, intercessions for mercy, processions of holy relics and candles burnt before the images of the saints. Small wonder that science and hygiene languished and that pediatrics sank to a very low level or ceased entirely.

While pediatrics at this time practically disappeared in Europe except for fragments of Galen such as the *Liber de passionibus puerorum Galeni,* it still flowed through the Byzantine empire where the encyclopedists carefully garnered the wisdom of the ancients and added bits of their own, such as the work of Oribasius on that vexing subject, the upbringing of children. Thence the stream flowed through the Near East and the Arabians, Averröes, Avicenna, and the others tried to bring order out of chaos, and Rhazes separated smallpox from measles. It all seems very simple now, but many are the obscure problems of today which will seem childishly simple tomorrow when some clear head has solved them.

With the renaissance, when the plague had purged Europe of half its population and relieved the more intelligent part of the incubus of maintaining hordes of helpless and hopeless humanity, men's minds were freed and science in Europe again moved forward. The stream of pediatric knowledge which had stagnated there like water in a dismal swamp again began to flow. It was an age of authority. The church spoke for theology, and hereties were burnt at the stake; various rulers represented the body politic and were equally as ruthless; Hippocrates, Galen, the Arabians had supplied medicine with dogma and creed, and no physician thought of questioning their authority.

Then the reformation and an age of doubting and questioning, and men again began to think for themselves. Here again the spirit of the ages, as it always has and always will, dominated pediatries. There is small need to speak of details. There came an age when astrology was one of the chief interests of man. The astrologer was more important at the birth than the midwife. Ballonius, who has been called the first modern epidemiologist, and who described whooping cough, was under its influence. How great a part the stars played in man's destinies may be had from the story of the queen of France whose bedroom in her chateau in Touraine communicated with that of the king's astrologer by a winding staircase. The king did not look with favor on the arrangement and informed the astrologer that on the morrow he would have him beheaded. "Sire," smilingly, bowing low, said the astrologer, "to do your bidding is my duty and pleasure, but last night I again read your horoscope and the stars say that you will die the day after I do." The astrologer was not beheaded. It makes little difference whether this story is true or not, it shows how completely the popular intellectual vagary of the age controls men's thoughts and actions, so that we seem scarcely more than puppets pulled by unseen wires.

The pediatric stream became more and more manifest. Ingrassius in Italy, Michael Doering and Sennert in Germany and Sydenham in England described scarlet fever, the latter added chorea; Richard Morton, chylous ascites; Glisson, rickets. These and many other things became a part of the pediatric knowledge. Other streams which joined the main flow quickly disappeared because the time was not ripe.

The mortality bills of London showed the need for infant welfare and those hardy eighteenth-century pioneers in this field, Thomas Coram, William Cadogan, George Armstrong, and Jonas Hanway, launched the idea, but it came to naught—just as did the campaign in the first decade of the nineteenth century. The whole thing had to wait until the twentieth century, and some of the most important work in this line has been done by members of this Academy.

Peter Camper's idea of the rats and plague fell on deaf ears. Walter Harris cured tetany with crabs' eyes, which were almost pure calcium,

but no one heeded. Lind's discoveries in regard to scurvy waited a century before they were put to general use. Doctors let blood, purged, vomited, sweated, and dosed their patients with extraordinary messes of drugs and filth until Heberden with ridicule forced the latter out of the British pharmacopeia, and Hahneman unwittingly did humanity a great service through his high-potency dilutions by showing the natural history of disease uninfluenced by drug interference—and some such revelation some day may be needed in reference to the natural history of disease and surgical interference even if the need be one of far less degree.

This subject might be pursued in greater detail but it has been shown that pediatric knowledge and progress is the product of its environment in any age. We have no better brains than our predecessors, but we live in an age of scientific discovery and of the practical application of what we have learned; the enormous progress of the past half century has been due to this. Without modern chemistry and physics we had remained at a comparative standstill. We sail the flood in magnificent vessels, but this golden age of science will certainly undergo an eclipse, perhaps at no distant date.

The history of human progress is a mere repetition of what has happened. Politically man seems incapable of learning anything. As Byron phrased it:

> This is the moral of all human tales;
> 'Tis but the same rehearsal of the past;
> First Freedom, and then Glory—when that fails,
> Wealth, Vice, Corruption—Barbarism at last,
> And History, with all her volumes vast,
> Hath but one page.

While this is true of the social life of man, it is not true of science. This is a new tale as yet but scarce begun; each new chapter is more fascinating than the last and we have seen it begin, to use an Oslerian phrase, to make a new heaven in medicine and a new earth in surgery. On the shields of two great American universities are the words "Veritas," "Truth," and "Veritas vos liberabit," "The truth will make you free." But we must remember Pilate's question: "What is truth?" Does any one know?

> Many loved Truth, and lavished life's best oil
> Amid the dust of books to find her,
> Content at last, as guerdon of their toil,
> With the cast mantle she had left behind her.

And humanity seemed no better off than it was before. But with the practical application of science, we have seen the desert made green, terrestrial space all but annihilated, and one disease after another rendered harmless or made to disappear—and we have just begun. This

is not a repetition of wars and famines but a new chapter in history. Man for the first time in the annals of the race has attempted to shape his destiny. He still wallows politically, but we have seen what persistent intelligent effort has accomplished in sanitation, in the changing death rate and have noted the corresponding change in the birth rate, perhaps a natural compensation and not due as much to contraceptives as some would have us believe.

That man can accomplish great things regarding disease has been demonstrated. It remains to be seen whether he can successfully apply what he knows to political and social life. With this in mind we may well ask ourselves if by taking thought we may direct the trend of pediatric progress. It seems doubtful but it is a fascinating subject. We must remember that no large movement designed to benefit the human race has ever done that; it always does the opposite or is at least attended with obvious disadvantages. Prohibition, which was to empty our jails, increased them and brought in the dubious advantages of racketeering and kidnapping. The child welfare movement, admirable as it is, has increased the number of the unfit, idiots, imbeciles, low-grade morons and those who transmit the hereditary diseases. So far it has been a matter of quantity, and in this curious age with science and sentimentalism blended, it is difficult to imagine that anything can be done about it. We send the flower of our youth to be killed in battle by the hundreds of thousands with the greatest patriotic fervor and enthusiasm but contemplate with horror any movement to combat the perpetuation of idiocy and unfitness. Eugenics as it deals with proper mating is a method which cannot be looked to as practical. It resembles gambling with the genes, those curious many-sided dice which Fate shakes and casts from her jewelled cup, and we poor mortals are but the sum of each fateful throw.

We have in sterilization, however, the opening wedge for the solution of the problem of the unfit and undesirable. This is no new idea. It has been toyed with by various states and countries. It might prove ineffectual, it might bring worse evils in its wake, but that does not seem probable. Germany is embarking on this experiment. Unfortunately most of us shall not live long enough to see its results, but it would seem to be a logical step to take.

Birth control is used extensively by the so-called better classes, or some unknown force is lessening the production of babies in what, according to our worldly standards, are regarded as desirables, while the obviously unfit go on breeding after the manner of guinea pigs. Leaving out this suggestion of sterilization, there seems at present no solution of the problem of the unfit. The obvious one is, of course, impracticable in this age; we are too far removed from Sparta. Since we have made quantity production and the maintenance of human life

a possibility, it would seem our duty to consider raising the quality. In this era when a dwarf behind his machine can do the labor of ten thousand or a hundred thousand men, there is small need for those who furnish only muscle-created energy or less. Freed from the burden of the mentally unfit, a vast wealth and energy could be utilized in improving the condition of the fit and who knows but that science, replacing clumsy political directed destinies of nations, might eventually lead to something more than the weary round, the ceaseless repetition, of known and predictable disasters.

Let us turn for a moment to nearer and more homely subjects. There are other things about which it might be well to say a word. One is the comparative waste of the younger graduates in medicine doing research work. Investigators are born, not made. Most internes doing research would not recognize a new thing if it came within their ken. True, they may do the drudgery of detail for such of their chiefs as are more considerate of their own achievements than of the welfare of their students. In my humble judgment their time could be employed more profitably in getting a knowledge of practical pediatrics, leaving research to those fitted for it.

In our devotion to the science of pediatrics we are liable to forget that it is also an art. The earlier pediatrists were all art and no science, and our present-day graduates are apt to be all science and no art. It it useless to know that a child should be operated on for appendicitis if you cannot quickly and easily convince the parents of that fact. We all know of instances when an appendix ruptured and what might have been a simple matter turned into a tragedy because the medical man in attendance could not present the matter clearly and convincingly. We have heard men remarking in the presence of an alert but very ill child: "If she lives until morning, etc., etc." The healthy doctor who has never known what it is to hang on every syllable the physician utters cannot realize what hours of needless suffering parents and the older patients undergo from careless, thoughtless utterances. In spite of all the efforts made to popularize medical knowledge, the average layman knows about as much about it as he does about Sanskrit roots. They nod intelligently and then usually get it all wrong. There should be two professors of pediatrics in every medical school, one to teach the science and one to teach the art. In occasional instances one man can do both, but rarely.

The student who is to be a practitioner, and most of them will be, is only too often trained in methods which belong to investigation.

The mass of facts already accumulated on pediatric topics is enormous, and the human brain could not contain them all, even granting the busy doctor had time to read the requisite number of pages. What is needed is a method of sorting out knowledge and presenting it

succinctly. This is today an unsolved problem. To illustrate what is meant, your attention may be called to the fact that the literature of poliomyelitis has been reviewed and over 8,000 good articles indexed by the International Committee. This by no means includes all of it. As the old saying has it, one cannot see the wood for the trees, and much precious material is buried and so lost. As early as 1867 Charles Fayette Taylor published a little book containing all the essentials of the management of this disease with a view of preventing deformities and protecting muscles, methods which applied intelligently would reduce the handicap of bad crippling from some 50 per cent to perhaps in the neighborhood of 15 per cent. These methods have been echoed by others but there is scarcely a textbook in which this part of the subject is mentioned, much less adequately dealt with. This is true, but perhaps not so vividly so of many other conditions. How to reduce the vast mass of pediatric literature to a usable, practical size is a problem worthy of our most eminent endeavor, and this done, how to make the practitioners of pediatrics consult it is another, and how the practitioner may acquire or be granted the power to speak with the tongue of men and of angels and so persuade his clientele is still a third problem. There is really no need for any child to die of diphtheria or of typhoid fever or of smallpox. We know that efforts have been made to enlighten the public and some progress has been made, but we are far from accomplishing what we ought, and here the fault is apparently not that of the profession but of the public, dear, stupid, lovable, ignorant, human nature.

Another subject of importance is the health of school children; much has been accomplished but it is only a very small fraction of what ought to be done. Sixty, or even 70, per cent of the school children of today have faulty posture. This could in a large measure be remedied by proper medical supervision and properly applied physical therapeutics, which in the larger schools might be done in groups. But the mere mention of spending any more money on the schools raises a howl from many sources and much mention of "frills" and editorials in leading newspapers about getting back to the little old schoolhouse with the "Three R's."

Now a few words about the immediate problems of the Academy. It is your organization, and its success depends on the Fellows and the State Chairmen, who must inspire and direct the work. The Academy is a departure from the usual medical society. We do not aim at ordinary meetings although we hope to make the time spent at them pleasant and profitable. What we are aiming at is an organization of pediatrists which can cooperate with all the existing agencies dealing with child welfare and make a determined effort to have men trained in pediatrics, either direct or advise with the directors of all

such organizations so that this work, the importance of which is becoming more and more manifest, may be led by pediatrists, not by laymen, whose information, experience and vision are often lacking no matter how good are their intentions.

State medicine is looming large on the horizon, and only by a determined effort can the work in pediatrics be kept in the control of men who have devoted their lives to this subject and not turned over to professional politicians and uplifters. We feel that private practitioners can work hand in hand with health departments, and so limit the spread of the paternalism, which is sending to clinics patients who need not go there.

The Academy aims to foster adequate hospital accommodations for children, and to this end is acquiring accurate information of conditions all over the country; it will not be long until definite recommendations may be made in this direction. We hope to point out the communities in which facilities are lacking and to further the extension of such accommodations. The members of the Academy should take an active part in milk supervision, medical inspection of schools, the health in schools; they should act as advisers to parent-teacher associations and other social agencies, give public instruction on the radio and educational talks.

There should be more cooperation between pediatrist and obstetrician; every lying-in department or institution should have adequate pediatric officers to supervise the infants from birth.

The Academy should also determine which communities are lacking in properly trained pediatrists and make every effort, through something similar to university extension work, to educate the general practitioners, who do the bulk of the pediatric practice, especially in the rural districts.

The gain in the membership has been gratifying. This year, as a depression measure, the initiation fee has been lowered for a twelve-month period to allow every pediatrist to join. The influence of the Academy, we hope and believe, will in a few years be so great that no qualified man can afford to remain outside of it. It is an altruistic enterprise and like almost everything else worth while in life you will get out of it what you put into it. If the members complain they are not getting anything out of it, let them ask themselves what are they doing to remedy this. There is work for all, if they will only do it.

The public should be informed as to who are qualified in pediatrics. The newly formed National Examining Board will take care of that in the future, but in the meantime the roster of the Academy members may well serve as a sort of "Who's Who in Pediatrics," and due publicity should be given this list.

The objects of the Academy should be to improve the health and welfare of children; to cooperate with existing agencies; to raise the standards of pediatric practice, and to encourage research.

My own bark has sailed the pediatric waters for forty years, visited many countries, and garnered many strange tales told by the mariners of bygone ages; even if my shipload is not of much value, I have found the voyage replete with interest, and I have enjoyed sharing what I have picked up along the way. And now I may summarize what I have already told you of my impressions of my trip: pediatric progress is shaped by the character of the age; a suggestion is offered that it might be possible to direct the trends of pediatric thought instead of letting them flow willy-nilly; the infant welfare work suggests possibilities, and in directing the trend we should aim at the birth and survival not of more infants, but of better ones, and that this may perhaps be accomplished by means which others have already suggested and which it would seem could be applied if physical and mental fitness ever again became a popular craze as it once was among the Spartan aristocracy. Other subjects which need attention are the teaching the art as well as the science of pediatrics, the sifting out of the best of our knowledge in some better way than that employed at present, and then of making practical application of what is already known, as well as the very important searching for new knowledge—and not only that but of getting the public to do the same, looking forward to the time, perhaps never to come but at least pleasant to dream about, when preventable diseases really will be prevented, those dependent on heredity controlled at the source, and the heritage of every child will be that of the old Latin ideal of a sound mind in a sound body. And when we consider what modern sanitation and medical science has accomplished in the past fifty years, it may not be as utopian a dream as it sounds at first. May the American Academy of Pediatrics be one of the organizations which will lead the way.

RECURRENT ABDOMINAL PAIN IN CHILDHOOD

JOHN LOVETT MORSE, M.D.
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WHEN a child has recurrent attacks of pain which it locates in the abdomen, the problem presented for diagnosis is always difficult. The underlying cause may be unimportant or very important. The pain may be due simply to gas from indigestion, or to some serious pathologic condition which will cause death unless it is recognized and properly treated. Even in children, that is, in those between three and twelve years of age, it is not always certain that the pain is really in the abdomen, or, if it is, in what part of the abdomen it is located, the testimony of young children as to these points being notoriously unreliable. The presumption is, of course, that the cause of the pain is located in the gastrointestinal tract. It may be, however, outside of it. In searching for the cause of the pain, it is always wise, therefore, to first look for causes outside of this tract. If they can be eliminated, then the trouble must be in the gastrointestinal tract.

I have attempted to get some figures as to the relative frequency of persistent or recurrent abdominal pain as the main presenting symptom in childhood, and also as to the relative frequency of the various causes of such pain by analyzing some fourteen thousand consecutive cases seen by me in private and consultation practice. As my practice has been almost entirely consultation for the last twenty years, it seems probable that my figures show a larger proportion of such cases than would be likely to be met in a strictly family practice, as the more unusual cases are the ones commonly seen in consultation. I know from my own experience, moreover, that a larger proportion of cases of recurrent abdominal pain from unusual causes are seen in hospital wards than in either private or consultation practice. In analyzing these cases I have excluded all those in which the pain was present for the first time, whether due to disease of the intestinal tract itself, for example, acute appendicitis, or to disease outside this tract, for example, pneumonia. Only cases in which the pain had been persistent for a considerable time or in which there had been many recurrent attacks of pain are included. In analyzing these cases it is probably best to take up first some of the causes which, on account of their rarity, are least important and those outside of the gastrointestinal tract.

TUBERCULOSIS OF THE SPINE (POTT'S DISEASE)

This condition should always be kept in mind. It will not be missed if the spine is examined and its flexibility tested. Roentgenograms may

be taken for verification, if necessary. In only two instances in this series were the children brought primarily for abdominal pain, the disease of the spine not having been recognized or even suspected. In the rest of the cases of Pott's disease other symptoms had directed attention to the spine.

PELVIC DISEASE

In no case in this series was abdominal pain due to disease of the internal female genital organs, tumors in the pelvis, or disease of the pelvic bones. I have seen instances in hospitals in which these conditions were the causes of the pain. They should always be kept in mind, therefore, and looked for.

LEAD POISONING

Lead poisoning in infancy from eating paint is not very uncommon. At this age abdominal pain is a most unusual symptom. Lead poisoning is much less common in childhood than in infancy. At this age also abdominal pain is not a common symptom. It was only a minor and inconstant symptom in the five cases in this series. Lead poisoning should be thought of, however, in children with recurrent attacks of abdominal pain. A lead line on the gums is almost never found in children of this age. Stippling of the red cells is inconstant. The quickest and easiest method of diagnosis is to take x-ray pictures of the long bones. This is much easier than testing the urine for lead.

URINARY TRACT

Renal Colic.—There were only two cases of renal calculi in this series. One of them had pain. Four others had typical attacks of pain which were supposed to be due to stones, but which later were proved not to be. Two others had attacks of severe pain from the passage of sharp crystals. They were shown not to have stones.

Pyelitis.—Pain is a not uncommon symptom in this condition in childhood. It is seldom, however, the predominating symptom. The diagnosis of "pyelitis" is, of course, easy when the urine is examined.

GALLBLADDER AND BILE DUCTS

There was but one case of hepatic colic in this series.

EPIGASTRIC HERNIA

This is always mentioned as one of the causes of persistent or recurrent abdominal pain. An epigastric hernia was found on routine physical examination in seven instances in this series. In no case were there any symptoms from it. Incidentally, I have never seen any symptoms of pain or discomfort from an umbilical hernia in childhood.

INTESTINAL WORMS

With the exception of pinworms, intestinal worms are uncommon in and about Boston. There were only four cases of tapeworms and three of roundworms in this series. None of them at any time complained of abdominal pain. There were thirty-seven cases of pinworms. In none of them were there any abdominal symptoms although many of them complained of itching and discomfort about the anus and external genitals.

There are two more causes of persistent or recurrent abdominal pain which are outside of the gastrointestinal tract. These are more common than those which have been discussed. They are abdominal adenitis, either retroperitoneal or mesenteric, and tuberculous peritonitis. The diagnosis of abdominal adenitis is often very difficult, that of tuberculous peritonitis usually not as hard.

ABDOMINAL ADENITIS

There were seventeen cases of adenitis in this series. Thirteen were proved to be tuberculous. The other four probably were. There were recurrent attacks of pain in seven, or 41 per cent. The adenitis was mistaken for appendicitis in four instances, the true condition being first recognized at operation. On the other hand, two cases thought to have adenitis were operated on and found to have chronic appendicitis. These mistakes show the difficulty in diagnosis. They show also that tuberculous adenitis must always be thought of when there is persistent or recurrent pain in the abdomen. In most instances the enlarged glands can be felt if they are looked for carefully. A positive tuberculin test is suggestive. Roentgenograms will often show beginning calcification in the glands.

TUBERCULOUS PERITONITIS

There were sixty-six cases in this series. Fifty of the patients were under three years of age; only sixteen more than three years old. This preponderance of babies is, I think, the rule. Pain was noted in only eight, most of whom were less than three years old. That is, pain is not a prominent symptom of tuberculous peritonitis in childhood. The symptoms at this age are usually indefinite for some time, malaise, anorexia, vomiting, loss of weight. The diagnosis was perfectly plain at the first examination in all but three. It had been missed by the other physicians who had seen these patients simply because they had failed to examine the abdomen carefully.

THE ERYTHEMATOUS GROUP OF SKIN LESIONS

In 1895, Osler[1, 2] published a paper "On the Visceral Complications of Erythema Exudativum Multiforme." In this paper he called at-

tention to gastrointestinal crises and hemorrhages from the mucous surfaces in connection with the skin lesions. Abdominal pain was a striking feature in the gastrointestinal crises. He said "the changes in the gastrointestinal canal, at least, are probably the counterpart of those which occur in the skin, namely, exudation of serum, swelling, hemorrhages, and in rare instances necrosis." This paper, as well as another on the same subject in 1904, and the condition which he described were gradually forgotten by most physicians. Trimble,[3] however, again called attention to it in 1931 in a paper entitled "The Erythematous Group of Skin Lesions With Especial Reference to Abdominal Pain." He deseribes purpuric lesions in these cases and says that pain usually precedes the appearance of the purpuric lesions. Pain may occur without purpura. In one case it lasted for three months before the eruption appeared. He says that recurring colic may be for many years the sole feature of this remarkable condition. A pathologic change in the intestinal wall is the cause of the symptoms.

This combination of erythematous or purpuric skin lesions with pain in the abdomen would seem from my series to be quite uncommon. The diagnosis of angioneurotic edema was made in twenty cases and that of erythema multiforme in nine. None of them had any abdominal symptoms. The diagnosis of erythema nodosum was made in eight cases. In one of them, a boy of five, the eruption appeared at the close of the last of repeated attacks of abdominal pain and indigestion. The others had no pain in the abdomen. Patients in eight cases of purpura had hemorrhage from the bowels as well as into the skin. None of them had pain.

GASTROINTESTINAL ALLERGY

Rowe[4] has been writing a good deal about this during the last few years. He believes that as the result of protein sensitization lesions like urticaria, angioneurotic edema, and dermatitis may occur in the gastric and intestinal mucosa as well as on the surface of the body. He seems to be describing in modern terms what Osler noted nearly forty years ago. He says the chief symptoms are abdominal pain and soreness, diarrhea (16 per cent) or constipation (39 per cent), sometimes vomiting. He believes that these symptoms are due to edema of the mucous membrane and spasm of the smooth muscle, which produce disturbances in peristalsis and function. Abdominal pain and soreness from food allergy may occur anywhere in the abdomen and simulate both acute and chronic conditions. They are most common over the cecum and ascending colon. The x-ray pictures sometimes show a spastic colon or duodenal stasis.

Since having my attention drawn to this condition I have seen one case of this sort. I believe, however, that it is more common than this experience would seem to show but not as important a cause of abdominal

pain in childhood as Rowe would like us to believe. It should always be taken into consideration if the child shows other manifestations of allergy or belongs to an allergic family. Rowe states that skin reactions are comparatively unsatisfactory in the diagnosis of this condition, which usually must be made on the history of food dislikes and disagreements and by the use of elimination diets.

INFLAMMATORY LESIONS OF THE GASTROENTERIC TRACT

Peptic Ulcer.—This is uncommon in childhood. Fosher,[5] writing in 1932, could find but nineteen reported cases of gastric ulcer, including his own. He found that the symptomatology was the same as in adults and thought that it should be recognized when present. He believes that duodenal ulcer is no more common than gastric. Bloch, Bronstein, and Serby[6] in a paper of the same year also emphasize the rarity of peptic ulcer in childhood. They say that it "does not produce the classical symptomatology noted in adults. Continued abdominal distress or cramps several times a day may constitute the sole subjective evidence. The hunger pain of ulcer is rarely noted."

My experience agrees as to the rarity of peptic ulcer in childhood. This diagnosis was made in but five cases; three of gastric and two of duodenal. In none of them were there any symptoms suggestive of ulcer until hemorrhage occurred. Nevertheless, the possibility of peptic ulcer as the cause of persistent or recurrent abdominal pain in childhood must always be kept in mind. In children roentgenograms will probably give more information than analyses of the gastric contents, and are much easier and pleasanter for the child.

Recurrent and Chronic Appendicitis.—These conditions are the ones most often suspected, both by physicians and the laity, when children have persistent or recurrent pain in the abdomen. They are, however, not as often the cause of these symptoms as is usually supposed. Nevertheless, they must always be kept in mind and excluded before any other diagnosis is made. The diagnosis of recurrent appendicitis was made in thirteen of this series. It was proved to be correct by operation in seven. That of chronic appendicitis was made in twenty-three cases and proved to be correct in fourteen by operation. In one instance in which the diagnosis of chronic appendicitis was made on the symptomatology and the evidence of roentgenograms, operation showed that the trouble was really tuberculous adenitis. In another patient, in whom further examination was refused, there was no recurrence of the symptoms. In the rest, all of whom were sent for an opinion, and roentgenograms or operation advised, the results are not known. No one knows, of course, how many of these cases I have missed. I do not think many, however, as I have always been on the lookout for them.

The diagnosis must depend very largely on the findings at physical examination during the attacks. Relatively little can be learned from the history. Rectal examination must not be forgotten. There is much difference of opinion as to the value of roentgenograms in the diagnosis of these conditions. I have found them of considerable value and always have them when there is any question as to chronic or recurrent trouble in the region of the appendix. In general, however, it is well to remember that the chances are that the trouble is not in the appendix.

Many surgeons believe that recurrent or cyclic vomiting is a manifestation of chronic or recurrent inflammation of the appendix. My experience does not bear this out. This diagnosis was made in 128 cases of this series. Only three patients died. Only seven had pain in the abdomen. In two cases, the attacks continued after the appendix had been removed to stop the pain before I saw the children. One patient in whom the diagnosis of appendicitis had been made but no operation performed, had only two or three more attacks of vomiting and nothing more to suggest appendicitis. In two cases, roentgenograms showed questionable adhesions about the cecum. One of them had also a redundant colon. The other had ptosis and was cured by a belt. In the others with pain, the attacks were always due to indiscretions in diet in neurotic children.

MALFORMATIONS OF THE INTESTINES

Most of the serious malformations of the intestines will have caused death in infancy. Those which are consistent with life are usually located in or about the duodenum or in the colon. All of them are likely to be associated with constipation as the result of interference with the passage of the intestinal contents. Pain may be caused by increased peristalsis above any constricted area or be due to fermentation in the intestinal contents. Kantor[7] found pain in about 40 per cent of the cases in adults in which the trouble was located in the duodenum, and pain in the right lower quadrant in 13 per cent of those with a low cecum, which he says is the most common anomaly.

Omitting the cases of redundant colon, which should be considered separately, there are but four cases of malformation of the intestines in my series. In one of these, moreover, the lesion found at the single x-ray examination was a constriction at the middle of the transverse colon. As this child also had attacks of asthma, it is quite possible that this was simply a temporary allergic manifestation. In only one of these cases was there abdominal pain. There were no cases of persistent Meckel's diverticulum. With this anomaly, moreover, the first symptom is far more likely to be hemorrhage than pain.

The diagnosis of a malformation of the intestine can be made, of course, only with the aid of the x-ray pictures.

REDUNDANT COLON

At birth and throughout infancy the large intestine, especially the sigmoid, is relatively longer in proportion to the small intestine than in later life. This fact must always be kept in mind before drawing the conclusion from x-ray evidence alone that the colon is longer than normal. Even in childhood it must be remembered that on account of the narrow pelvis the colon is forced to adjust itself to its surroundings by reduplication and will, in consequence, give a different picture from that in the adult. Nevertheless, there is, I think, little doubt that the attainment of the adult relationship is not infrequently delayed and that, in consequence, the colon really is redundant and constitutes an abnormality. In these cases, however, the colon, while long and crowded into folds, is not dilated. Redundant colon is one of the common causes of constipation in early life, and the constipation is not infrequently accompanied by pain as the result of exaggerated peristalsis.

This diagnosis, proved by x-ray pictures, was recorded but three times in my series. I am sure, however, that it was present far more often than that, the diagnosis being put down as constipation or indigestion. Pain was noted in two of the three cases with this diagnosis. Kantor, however, reports pain in 60 per cent, gas distress in 70 per cent, and tenderness in the right lower quadrant in 24 per cent of his adult cases.

The diagnosis can be made only with the aid of the x-ray pictures. Great care must be used, however, in interpreting the roentgenograms because of the great variations in the normal.

The treatment is symptomatic. Time will cure most cases in children. A supporting belt often helps. Operation should never be performed.

SPASM OF THE INTESTINES

This is usually spoken of as "spastic colitis." This is not a proper term, as the spasm is not always in the colon, and in uncomplicated cases there is no inflammation of the bowel. Physical examination, except for occasional tenderness, is negative. It is usually associated with constipation and quite frequently with pain, which is often severe and prolonged. Roentgenograms may or may not show contracted areas of the intestine, according to whether spasm is present at the time or not. The pictures will vary from day to day.

The explanation of the symptoms and x-ray findings is presumably muscular incoordination, which causes spasm of the circular muscular fibers. This spasm may involve only a few fibers or considerable sections of the bowels. It may last for an instant or persist for hours. Hence the variation in the severity of the symptoms. It is said that the spasm may be limited to the anal muscles.

This condition is not a manifestation of spasmophilia, i.e., of a low blood calcium. It is said to occur most often in hypertonic children with

nerve imbalance. This may be true, but it has not been my experience, unless its existence is taken as prima facie evidence of hypertonicity. It is intriguing to attribute it to a disturbance of the vegetative nervous system. Perhaps it is, but this explanation does not help us much.

I find this diagnosis but once in my series. I am positive, however, as I look back, that I have seen many cases which I failed to recognize, because I have only recently realized the importance of this condition. The diagnosis has to be made largely by a process of elimination. Repeated roentgenograms will help to confirm it. The relief of the symptoms when belladonna and a low residue diet are given proves it.

INJURIES TO THE ABDOMEN

In several of my cases recurrent attacks of pain persisted for some months after a fall or blow on the abdomen. It is safe to assume with such a history that the attacks are the result of some lesion of the intestine, like a hemorrhage into the wall, or adhesions resulting from a localized peritonitis.

PSYCHIC CAUSES

I have seen many cases of recurrent abdominal pain in which I felt that the symptoms were exaggerated because of the emotional make-up of the child or because of undue solicitude on the part of the parents. I have never seen one, however, in which I did not believe that there was a real pathologic basis for the symptoms.

CONSTIPATION AND INDIGESTION

There are over twenty-five hundred cases in this series in which the diagnosis was indigestion and 350 which were diagnosed as constipation. I have not had the courage to go through them all to find how many of them were babies and how many children, or to find what percentage had pain and what did not. I am certain, however, that many of them did and that their pain was relieved when they were properly fed, their life regulated, and their bowels kept open. I am equally positive that the number of these cases was far greater than that of those who had the more serious conditions which have been discussed. I regret that I am not able to prove it, because I realize thoroughly of how little value impressions are.

It is evident, however, from the analysis of these cases that it is not safe to assume that recurrent or persistent abdominal pain is due to improper food, improper methods of eating, overfatigue or lack of proper attention to the bowels, although in the vast majority of cases I am assured that it is. Every case must be studied carefully for causes of pain outside of the gastrointestinal tract. If none of these are found and the symptoms do not yield promptly to regulation of the diet and

life, a gastrointestinal series of x-ray photographs should be taken after an opaque meal and others after an opaque enema. The question of allergy should be investigated and the possibility of intestinal spasm kept in mind. In this way only can the cause of the pain be positively determined and due justice given the patient.

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ATYPICAL CHONDRODYSTROPHY

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THE syndrome of chondrodystrophy as described by Parrot[1] in 1876 and called by him "achondroplasia" is by no means as uniform in its manifestations as has been supposed. Pathologically Kaufmann[2] has distinguished hypoplastic, hyperplastic, and malacic forms. Since his publication, many atypical cases have been described, but opinions differ as to whether these really belong among the chondrodystrophies. Roentgenographically a great variety of forms has been observed which are still unclassified. Among others describing these are Budde,[3] Frangenheim,[4] Grudzinski,[5] Jaroschy,[6] Krabbe,[7] Porak,[8] Silfverskiöld,[9] and Weil.[10] It appears, therefore, that the classical syndrome of chondrodystrophy (Parrot) represents but one form of the disease, and that only a typical case of chondrodystrophy can be recognized at a glance.

Morquio[11] has recently described as an entity under the name of "dystrophie osseuse familiale," a syndrome of dwarfism with roentgenologic changes in the bones. The development of the children in these cases is apparently normal until the end of the first year of life, their symptoms becoming noticeable only after they begin to walk. The trunk, spine and extremities are affected, but not the skull and facial bones. Enlargement of the bones is found at the sternum; the spine; and the epiphyses of the elbows, shoulders and knees. In other situations, as at the wrist, ossification is retarded. The ligaments and muscles are flaccid. The joints are hyperextensible, with the exception of those that are inhibited by hypertrophies of the bones. Externally there are shortening and broadening of the thorax and deformity of the spine. The process is not painful, but there are severe functional disturbances. Thus, the knock knee, flatfoot, and muscular weakness cause a typical waddling gait, and the motor power of the hands and feet is diminished. Intelligence and sexual development are normal and correspond to the patient's age.

Roentgenograms reveal severe changes in the process of ossification, which Morquio erroneously attributed to the decrease in blood calcium found in his cases. Rarefaction, destruction, retardation of growth, or complete lack of the epiphyses of all bones have been found.

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The disease is often familial and hereditary, and consanguinity of the parents has been reported in several instances. Syphilis, alcoholism, and other diseases of the parents do not appear to be causal factors.

Following Morquio's publication, a number of cases were described which resembled each other so closely that all of the authors agreed to classify them as a special entity, Morquio's disease. Undoubtedly the disease had been observed and described before Morquio's time by Nilsonne[12] in 1927, and by Weil[10] in 1928, who described cases showing flattening of the vertebrae (platyspondylisis), which seem to belong in this category. According to Valentin,[13] the two cases of Rabinovitsch and Muchin[14] may also be included.

Nilsonne[12] described osseous changes in three brothers, whose parents and five sisters were well. The brothers were short in stature and had long upper extremities, the fingers reaching as low as the patella. The vertebral bodies of the lumbar and dorsal spine were flattened and the cranial and caudal surfaces of them were uneven. In general, however, the osseous structure was normal. Genu valgum was present, and in two cases shortened collum femoris. The author discussed the differential diagnosis of rickets, Scheuermann's disease (osteochondritis deformans juvenilis dorsi), and chondrodystrophy.

Lance[15] described two cases of generalized platyspondylisis. One of them, a child, twenty-six months old, also had bilateral congenital dislocation of the hips and bilateral clubfoot. However, the author did not consider this a systemic affection, and, since no roentgenograms of the extremities were reproduced, there is little evidence that the case belongs in this group.

Two cases of platyspondylisis were reported by Weil.[10] In one, only the changes of the spine were present, while the other presented in addition signs of chondrodystrophy.

Mention has already been made of Morquio's description in 1929 of similar deformities in four children in one family.

Valentin[13] reported two cases. He deserves credit for emphasizing platyspondylisis as one of the essential symptoms of the disease. He suggested the name "osteochondropathia multiplex."

Deutschländer[16] and Denecks[17] described one case each of platyspondylisis in chondrodystrophic children.

Ruggles[18] described Morquio's disease in eight children. In one family of seven children, three showed the syndrome, and in another family, two. In the other three children there was no familiar history of osseous disease. In neither family was there consanguinity of the parents. The clinical symptoms resembled those of Morquio's disease, but, in contrast to Morquio's findings, the blood calcium was normal.

Campbell[19] reported the case of a boy, twelve and one-half years old, who showed marked delay of osseous development in some epiphyses, and too early synostosis in others. There were also abnormally flattened vertebral bodies; high intervertebral disks; absence of the epiphysis of the head of the femur, which normally develops at the tenth month; short fibula; and poorly developed cortex of the long bones.

Brailsford's[20] case of chondro-osteo-dystrophy doubtless belongs in this group. The boy, aged three years and nine months, was apparently normal up to the thirteenth month of life. He could stand upright, but when he walked, he supported his trunk by putting his hands on his knees. The roentgenograms revealed wide joint spaces; irregular and fragmented epiphyses, especially of the metacarpus and metatarsus; irregular shape and size of the vertebral bodies; and dislocation of the lumbodorsal vertebrae. The long bones were short and thick.

Meyer and Brennemann[21] described a case, which in its clinical and roentgenologic aspects resembled Morquio's cases to a marked degree. There were, however, no familial occurrence and no consanguinity of the parents. The blood calcium was normal.

Coward and Nemir[22] report two cases in Italian brothers whose parents were not related. Blood calcium, phosphorus, and basal metabolism were normal. Platyspondylisis, shortening of the fibulae and radii, and fragmentation of the epiphyses were present. One child was born with a crooked left arm.

Barnett[23] described two cases of the same type in sisters, in whom marked generalized epiphyseal disturbance and abnormal cartilage growth were present.

Ellman's[24] case of an only child, fifteen years old, whose parents were first cousins, also resembles Morquio's disease.

By external examination the affection (Morquio's disease) can readily be distinguished from the type of chondrodystrophy described by Parrot.[1] The difference is so marked that some authors do not even consider the possibility of chondrodystrophy in the differential diagnosis. The classical type of the chondrodystrophic dwarf is characterized by a relatively large head, a prominent forehead and a flattening of the bridge of the nose, almost normal length of the trunk, short extremities, and well-developed musculature. All of these signs are supposed to be present at birth. On the contrary, children with "dystrophie osseuse familiale" have normal development of the head and face, marked shortening of the trunk in the craniocaudal direction and relatively long extremities. The musculature is flaccid and underdeveloped. Usually no changes are to be seen at birth.

The symptoms of chondrodystrophy, however, are not always so uniform or regular as often stated. The shape of the skull in the classical type is caused by premature tribasilar synostosis. H. Müller[25] and Hecker[26] have described exceptions to this rule. Kaufmann[2] distinguished two types of cases: one with a deep depression at the root of the nose and the other with a flattening of the entire nose. The picture in Siegert's[27] paper on chondrodystrophy (Tab. 4, Figs. 1, 3) does not show the typical shape of the skull and face; and a survey of the illustrations of the numerous atypical forms described in the literature leaves one with the impression that the formation of the face and skull should not be overestimated in diagnosis.

The behavior of the centers of ossification and of the epiphyseal spaces is considered to be essentially different in chondrodystrophy and in osseous dystrophy. According to Ruggles,[18] chondrodystrophy is characterized by the appearance of the ossification centers at the proper time and also by the premature closing of the epiphyseal centers. In contrast, in osseous dystrophy the ossification centers are supposed to develop late. However, as early as 1912 Siegert[27] stated that in chondrodystrophy some ossification centers in the same hand may appear prematurely and some late, and accordingly concludes that the time of appearance is not significant in this condition.

In marked cases of chondrodystrophy the shortness and thickness of the long bones is typical, but occasionally these symptoms, as well as the typical shape of the hand, may be partly or entirely absent (Jaroschy,[6] Silfverskiöld[9] and others).

Normal length of the trunk, which in the classical syndrome of chondrodystrophy contrasts with the short extremities, is due to normal development of the height of the vertebral bodies. In osseous dystrophy the vertebrae are flattened, a fact which was emphasized by Valentin. Although the length of the trunk in chondrodystrophy is frequently normal, the old conception that the spine is unaffected has been found to be incorrect. The pathologic changes have been carefully described by Kaufmann,[2] Breus and Kolisko,[28] Sumita,[29] and lately by Donath and Vogel,[30] the last named authors concluding that the adult spine in the chondrodystrophic dwarf is never normal.

Chondrodystrophy, originally called fetal rickets in contrast to osseous dystrophy, has been described as a fetal disease that is fully developed and recognizable at birth. We had an opportunity of examining a chondrodystrophic dwarf, aged five years, whose parents did not notice any abnormality until the end of the first year of life. Krabbe[7] described an atypical instance in which symptoms developed when the child was six years old. On the other hand, osseous dystrophy does not necessarily develop only after infancy. For example, Ruggles[18] says: "The condition is congenital and early signs of it

are apparent at two to three months of age. In some cases they are overlooked until the child begins to walk." Coward and Nemir[22] described a case that showed a deformity of one arm at birth.

Thus it is seen that the syndromes are not constant, and that the symptoms of chondrodystrophy vary more than is generally supposed. Should Morquio's osseous dystrophy be considered a distinct syndrome or an atypical form of chondrodystrophy? Campbell[19] is correct in his assertion that, if there are no transitional forms between osseous dystrophy and chondrodystrophy, the two diseases are probably not identical. The case which we shall report, however, seems to be a link between the two diseases, a differentiation being almost impossible since the patient showed characteristic symptoms of both diseases.

CASE REPORT

J. O., male, twelve years old.

Family history.—The father was born in Italy. He was fifty years old and was employed in the metal trades. He was of small stature and had arteriosclerosis, proved by roentgenograms; his general health was good. The mother was living and well. There were nine children in all; three were dead of unknown cause; the others were living and well. There was no history of consanguinity of the parents.

Past history.—The patient was the fifth child. The pregnancy, which was of normal duration, was terminated by a normal delivery. Labor lasted one and one-half hours. The weight at birth was nine pounds. The child was breast fed for twenty months, no additional food being given. He could hold up his head at four months of age, sit up at six months, and stand at one year. The first teeth appeared at nine months. At the age of two years when he started to walk, a peculiar waddling gait was noticed; and from that time his physical growth was retarded, but his mental development was normal. He had had measles. At the age of three years the parents noticed that his hands and feet appeared unusually large. Since the age of six years he complained of pain in the feet and knees, which was especially noticed after walking. He was able to run only with considerable difficulty and he ascended stairs slowly.

Present illness.—On September 13, 1933, when he was twelve, he was referred to the Children's Hospital because of his unusual gait, his short stature, and the limitation of motion of his arms. His general health had been good.

Physical examination.—On admission to the hospital the outstanding features of the general examination were the short stature and a peculiar waddling gait. The child's height was 50¾ inches and his weight 60½ pounds. His nutritional status was good. His muscles were generally well developed and firm, but the deltoid, as may be seen in Fig. 1, was atrophic so that the clavicles on superficial examination seemed not to be firmly attached and to be displaced posteriorly. His alertness and response to questions indicated an average mental development of a boy of his age. His hair and eyes were dark and his skin deeply pigmented, as expected from his southern European nationality. There were twenty-six teeth. Three of the molar teeth were carious. The chest was normal in shape and was twenty-seven inches in circumference. There was no evidence of a rosary. The examination of the heart and lungs revealed nothing abnormal. The abdomen was below the chest level and

the circumference was twenty-five inches. There was a suggestion of abdominal protrusion caused by a rather marked lordosis of the spine. The genitals were normal in development. The reflexes were normal, and there were no unusual neurologic findings.

Fig. 1.—Photograph of J. O. at twelve years of age. The lines shown are at 6-inch intervals.

Extremities and bony framework.—The chief abnormal findings were limited to the bony development. The skull was fairly symmetrical in shape and it appeared large in proportion to the rest of the body, but the circumference was only 21 inches. The features of the face were rather prominent especially in the maxillary region, but there was no great disproportion. The clavicles were normal in shape, but the distal ends seemed not to be firmly attached and were displaced posteriorly.

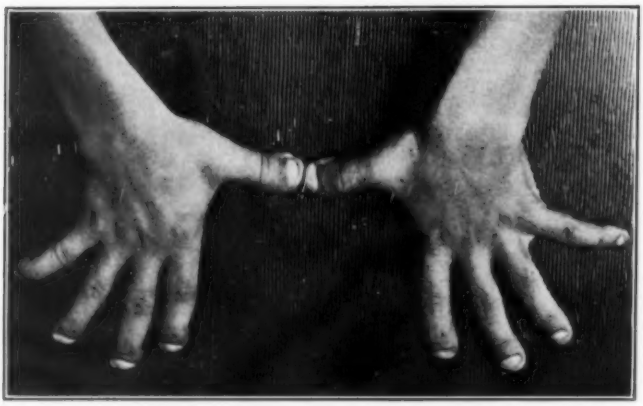

Fig. 2.—Hands of J. O. Note the enlargement of the terminal phalanges.

Fig. 3.—Spine, showing irregularities on the anterior aspects of the bodies of the fourth and fifth vertebrae.

Apparently this interfered with the elevation of the arms. The arms and legs were normal in length but the epiphyses were enlarged. The upper arms were short in comparison with the forearms. The hands were large and square and the fingers were enlarged especially at the terminal phalanges (Fig. 2). There was no limitation of motion except of the arm, which could not be lifted above the level of the shoulder. The thighs were normal in shape, but extension and abduction were limited. The hips and knees were enlarged. There was a slight genu valgum. The lower legs were normal. The feet were large, and there was considerable deformity of the metatarsal bones, which gave the foot a short and broad and flat appearance.

Fig. 4.—Right upper extremity. Note the irregularities of the epiphyses of the shoulder and elbow joints.

Laboratory findings.—Several examinations of the urine revealed nothing abnormal, and the blood showed only a mild anemia. The stained smears showed no abnormalities. The serum phosphorus was on one occasion 5.5 mg. per cent and on another 5.1; the serum calcium was 12.3 mg. per cent and 11.8 on another examination.

Roentgenograms.—There were no abnormal findings in the bones of the skull, no abnormal shadows in the brain tissue, and the sella turcica was normal. The bodies of the fourth and fifth vertebrae and a small portion of the sixth showed irregularities on their anterior aspects, which at least indicated slow development

Fig. 5.—Right wrist of J. O. The centers of ossification are irregular and smaller than in a normal child of the same age; the epiphyses of the radius and ulna and the proximal ends of the metacarpal bones are also irregular.

Fig. 6.—Hip joint. The acetabulum is irregular; the epiphysis of the head of the femur is not demonstrable; the outline of the neck is irregular.

for a child of twelve years of age (Fig. 3). The vertebral bodies were not flattened, that is, there was no platyspondylisis. The well-calcified humerus was short and thick; the proximal epiphysis was irregular in outline, and at the distal epiphysis there was a fragmented appearance of the external and internal condyles (Fig. 4). The shaft of the ulna was slender and both epiphyses were irregular in shape (Fig. 4). The distal epiphysis of the radius was irregular and thickened (Fig. 5). In the carpus there were six ossification centers (Fig. 5). These were smaller than normal and irregular in outline. The proximal extremities of the carpal bones were

Fig. 7.—Right knee joint. Note the ragged appearance of the distal epiphysis of the femur, the underdevelopment of the proximal epiphysis, and the normal length of the fibula.

irregular, and there was irregular reticulation of the bony structure. The phalanges were thicker and shorter than usual (Fig. 5). In the pelvis the crest of the ilium and the symphysis pubis were irregular in contour, and the acetabulum showed irregularities in calcification and in outline (Fig. 6). The epiphysis of the head of the femur was not demonstrable, and there was an uneven and irregular appearance of the neck. Both the major and minor trochanters seemed fragmented. The shaft was normal in length and shape. Instead of a regular and smooth line of calcification of the distal femoral epiphysis, there was a ragged and fragmented termination (Fig. 6). The proximal epiphysis of the tibia was underdeveloped and fragmented,

and was not overtopped by the fibula (Fig. 7). The bone was normal in shape but there were irregularities of the distal end. Except for the distal epiphysis, the fibula was normal. Both the calcaneus and the talus showed irregular outlines and structure; the os naviculare was deficiently calcified and represented as an irregular disk. The shapes of the cuboid and cuneiform bones were also abnormal. The proximal ends of the metatarsal bones were distended, their edges irregular and the calcification defective. Except for the distention this was also true of the distal ends. There was a peculiar spur-like formation at the distal end of the fifth metatarsal bone. The bony structure of the phalanges was loose and reticular, and the bones of the first toe were short and thick (Fig. 8).

Fig. 8.—Right foot. Note the disk-like shape of the os naviculare, the club-shaped proximal ends of the metatarsal bones and the defect at the distal end of the fifth metatarsal.

This case presented certain features of chondrodystrophy, but as others were lacking, it was difficult to decide between this diagnosis and that of osseous dystrophy. In reality the case represented an intermediate form between the two diseases. It had in common with Morquio's disease: normal skull and conformation of the face, lack of micromelia, lack of development of the epiphysis of the head of the femur, genu valgum, normal length of the fibula, waddling gait, and some faulty development of the musculature. The apparent late onset of symptoms also speaks for Morquio's syndrome. The case resembled Parrot's type of chondrodystrophy in that the neck and trunk were of normal length; there was no platyspondylisis; and the humeri were short and thick.

SUMMARY

There is described the case of a boy, twelve years old, who presents features which probably warrant placing his condition as intermediate between chondrodystrophy (Parrot) and osseous dystrophy (Morquio). This suggests that the two diseases have a common basis.

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OBSERVATIONS ON THERAPY IN ERYSIPELAS

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IT IS only within recent years that the proper evaluation of therapeutic results in erysipelas has been subjected to a more careful consideration. The appearance of several excellent papers of a highly critical nature has been of inestimable value in the analysis of procedures considered to possess merit in the treatment of this disease. It is apparent that one must be entirely familiar with the natural course of the disease before beneficial results can be attributed to a therapeutic agent. In 1927 Schaffer[1] drew attention to a fact previously emphasized by Ker that the chances of recovery are definitely influenced by the age of the patient. The relationship of mortality to age is summed up by Ker[2] as follows: "Erysipelas is extremely fatal in the newly born, and the mortality, as will be seen in the table, is high up to the age of five years, and considerable up to ten years. The fewest deaths occur in the decade from ten to twenty years, and thereafter the fatality rate increases steadily with age until a figure of over 25 per cent is reached for patients above the age of seventy." The table of 1,643 consecutive cases is copied from his book.

TABLE I

REPORTED MORTALITY IN ERYSIPELAS*

AGE PERIODS	CASES	DEATHS	DEATHS, PER CENT
0 to 5	78	9	11.5
5 to 10	50	2	4.0
10 to 20	186	3	1.6
20 to 30	272	6	2.2
30 to 40	296	11	3.7
40 to 50	345	16	4.6
50 to 60	235	23	9.7
60 to 70	137	14	10.2
70 +	44	11	25.0
Totals	1,643	95	5.7

*Ker, C. B.: Infectious Diseases, London, Oxford University Press, 1920.

Since conclusions derived from studies on young adults in whom death so seldom occurs are of little worth, Schaffer and I attempted to compare a series of untreated cases occurring in infants with a group treated with blood transfusions. In cases of patients under one

From the Department of Pediatrics of the Los Angeles County Hospital. Read at the Second Annual Meeting of Region IV of the American Academy of Pediatrics, November 10, 11, 1933.

year of age reported by various authors as receiving only local treatment, the mortality rate is uniformly over 40 per cent. If many of the cases included in any series are under one month of age the mortality rate is correspondingly higher and often exceeds 75 per cent. If one simply considers the cases in our series under one year of age, the mortality rate in the untreated group including forty-eight cases was 56 per cent as compared with fourteen cases in the treated group with a mortality rate of only 28 per cent. The report is subject to criticism in that alternate cases were not treated, and for that reason a comparison with cases occurring in previous years is less accurate. Second, the small number of cases in the treated group leaves the interpretation open to doubt. As pointed out by Raymond Pearl, only a little consideration is necessary to convince anyone that the trustworthiness or reliability of any conclusion is in a large measure a function of the number of cases on which it is based. It seems likely that our group was simply a sample picked at random, what the biometrists term "random sampling," and that the figures are not truly significant. We did not have sufficient cases to determine whether our results were pure chance or if in all subsequent series approximately the same mortality could be expected. However, Schaffer rewrote the chapter on erysipelas in the tenth edition of the Holt and Howland textbook and reported additional cases treated with blood transfusions with a distinctly lower mortality as compared to the untreated group.

Single case reports are of no value, as it has been everyone's experience that even patients with the most severe types of the disease in which extensive areas are involved have occasionally recovered without any treatment having been used. A spontaneous crisis has also been observed on practically every day of the disease beginning with the third, and the temperature will often drop to normal without any previous warning or indication. For this reason, it is nearly impossible to differentiate a spontaneous crisis from an artificially produced crisis. Jacobsen's[3] case of an infant, twenty-two months old, who failed to respond to erysipelas antitoxin during an attack of erysipelas and also during a recurrence, but in whom immediate crisis occurred on both occasions following blood transfusions, is of interest, but is always open to the criticism that the same result may have taken place irrespective of the treatment. A similar comment is applicable to Kaiser's[4] case of postvaccination erysipelas treated favorably with convalescent erysipelas serum. The only definite proof of the efficacy of any therapeutic agent in this disease is the reduction of infant mortality in a large series.

The early enthusiasm associated with the introduction of erysipelas antitoxin seems less in evidence today. Birkhaug's investigations

have been in part repeated by Francis,[5] who was unable to corroborate his results. Francis has briefly summarized Birkhaug's major observations as follows: "Hemolytic streptococci from erysipelas were found to form an immunologically specific group of streptococci. No cross agglutination with streptococcus scarlatinae was noted. Serum obtained by immunizing rabbits against strains of erysipelas streptococci protected the skin of normal rabbits from infection with the homologous and heterologous erysipelas strains when the serum and bacteria were injected together. The immune serum caused a blanching of the erysipelatous lesion in patients or tended to prevent its spread. This effect was not obtained with scarlatinal antitoxin, nor was blanching of the scarlatinal rash obtained with anti-erysipelas serum. Blanching of the erysipelatous lesion was also obtained with convalescent erysipelas serum. Broth cultures of erysipelas streptococci uniformly gave toxic filtrates which in dilutions of 1 to 1,000 produced a skin reaction in susceptible individuals similar to a positive Dick test. The cutaneous reaction produced by 1 S. T. D. could be completely neutralized by mixing the skin test dose with an equal amount of convalescent erysipelas serum, or with 0.001 c.c. of erysipelas antistreptococcic rabbit or donkey sera. Anti-erysipelas donkey or rabbit serum produced favorable therapeutic results when given early in the disease. The impression obtained was that the serum was antitoxic in nature. A positive or negative skin reaction was considered to indicate incomplete or complete neutralization of circulating toxin, respectively."

Birkhaug pointed out that the results of his studies on erysipelas present a striking parallelism with the observations on scarlet fever reported by Dick and Dick and others. Francis has rightly insisted that clinically this parallelism does not exist for the following reasons: "Scarlet fever is most prevalent between the ages of six months and twenty years; erysipelas is most prevalent under six months and over twenty years. An attack of scarlet fever almost invariably gives lasting immunity, whereas erysipelas often renders individuals more prone to subsequent attacks. In scarlet fever the most prominent clinical phenomena are produced by the absorption of toxin from a local focus of infection, whereas in erysipelas the lesion is associated with actual infection of the skin by streptococci, and dispersed specific lesions comparable to the toxic lesions of scarlet fever are not present." Francis' results differed from Birkhaug's in three respects, namely, the tendency for the cutaneous reactivity of erysipelas patients to become more marked during convalescence; the absence of a demonstrable toxin in the circulating blood of patients in the acute stage of the disease; and the neutralization of erysipelas streptococcus culture filtrates by the serum of most patients in the acute phase of

the disease with apparent loss of the power during convalescence. He concluded "that the pathogenesis of erysipelas is not comparable to the pathogenesis of the specific toxic phase of scarlet fever, and that the mechanism of recovery from erysipelas in adults at least is not a simple neutralization of a circulating toxin through the development of an antitoxin, but rather that it is more intimately related to the development of allergy to products of the growth and dissolution of streptococci in the erysipelatous lesion. Furthermore, the failure to find toxin in the blood and the usual presence of a neutralizing antibody in the early acute stage of the disease provide little basis for the view that antitoxin treatment in adults should be of particular value in erysipelas."

Several reports are mentioned by Birkhaug as lending excellent clinical corroboration to his laboratory studies. One was the Bellevue series published by Symmers and Lewis.[6] This report, although forming the basis of the extensive advertising propaganda instituted by the Lederle Company, failed to take cognizance of the variation in mortality in the different age groups. They reported 131 patients irrespective of age with a mortality rate of 5.3 per cent following treatment with antitoxin, as compared to 107 untreated cases with a mortality rate of 11.2 per cent, and concluded that antitoxin was an effective therapeutic agent and that "as far as the immediate attack is concerned, erysipelas is now a vanquished disease." McCann's[7] criticism of this report is especially praiseworthy. He pointed out that there was no division into age groups; that control and treated cases were observed in different years; that both groups were observed for a period of only forty-nine days in each year; and that both groups occurred in months of relatively low mortality of erysipelas, namely May and June. He concluded as follows: "If one examines critically the results reported by Symmers and Lewis, much of their apparently favorable significance disappears." McCann also pointed out that "the incidence of a few more or a few less children would have a profound effect on the statistics."

Reports such as the one by Platou, Schlutz, and Collins[8] of eighty erysipelas patients from twelve weeks to eighty-four years of age treated with x-ray with a resulting mortality rate of 6 per cent are subject to similar criticism. Incidentally their figures are slightly less favorable than in Ker's untreated group.

In any survey, it is essential that one discuss only similar and therefore uncomplicated cases of erysipelas. In addition to the factors previously mentioned, one must consider the presence of a concomitant disease, a possible geographic variation, evidence that the patient is naturally improving at the time therapy was instituted, and particularly the presence or absence of a positive blood culture. The

grave prognosis associated with a secondary blood stream infection has been emphasized by Sprunt.[9] No one to date has reported a large series of cases in which these factors have been carefully observed.

If one reviews the cases of patients under one year of age treated with erysipelas antitoxin reported by Eley,[10] the mortality is not less than any other series. There were twenty-four cases with eleven deaths, a mortality rate of 45.8 per cent. Eley, however, drew attention to the lower mortality in the group that received antitoxin within seventy-two hours after the onset in contrast to the group treated after the seventy-two-hour period. In the group treated early, the mortality rate was only 21 per cent, whereas in the group treated late in the disease the rate was 80 per cent. These figures are of course very important. McCann's thirteen cases of patients under one year of age included nine deaths, a mortality of 69 per cent. The patients who died were treated on an average of ninety-one hours after the onset, so that this is additional confirmation that antitoxin administered late is without value. In an attempt to corroborate Eley's conclusions, Dr. Bigler and I reviewed all the cases of erysipelas occurring in the Los Angeles County Hospital in patients under one year of age in the five-year period from July, 1928, to July, 1933. There were forty-one cases with a mortality rate of 41.1 per cent. The treatment was varied as a different group of attending physicians are on service every six months. Some received local treatment only, others erysipelas antitoxin, others blood transfusions, and some a combination of all three. There were nearly twice as many cases as in Eley's report, and a total mortality slightly lower than his. Of the twenty-one of our patients receiving antitoxin eleven died, a mortality rate of 52 per cent. In respect to treatment before or after seventy-two hours from the onset of the disease, our figures are at variance with Eley's in that the mortality rate in the group treated early was 60 per cent and in the group treated late 45 per cent. One can only conclude that if erysipelas antitoxin is of value, no definite proof has been presented and one is justified in maintaining an attitude of skepticism. The majority of our cases occurred in the months of January, February, March, and April; and in the five-year period there was no year in which the mortality rate seemed unduly high as compared to another. The report can be criticized in that there was no control series; all the cases were not observed personally; information obtained from records is an inferior method of study; and blood cultures were not performed on all the fatal cases. In infants under one month of age with erysipelas and sepsis, death is practically inevitable. One patient received antitoxin on the second day of the disease, a blood transfusion on the next day, and convalescent blood the following day with no benefit. In many of the cases the spread of the local lesion was not checked after serum treatment. Ker's

opinion, "a serum can be of little value if marked spread of the local lesion takes place after one or two adequate doses," is worth repeating. More carefully analyzed reports are necessary before any final conclusions can be made.

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MENINGITIS IN THE NEWBORN

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MENINGITIS in the newborn has been considered a rare disease. An increasing amount of literature on the subject with additional case reports would indicate that it is probably more common than we have generally realized. It is not unlikely that many deaths from unknown causes in newborn infants have been due to meningitis since the symptoms are often obscure. There is not much in common between the symptomatology of meningitis at this early age and that which occurs at a later period.

In a general way the etiologic factors in the cases seen in the newborn also differ from those of later life. The meningococcus and tubercle bacillus play minor rôles. Barron[1] reviewed forty-two cases of meningitis in infants, nineteen of which were in the newborn. Of these, seven were caused by the colon bacillus, six by the staphylococcus and streptococcus, two by the pneumococcus, one each by the meningococcus, *Bacillus mucosus capsulatus, Bacillus lactis aerogenes,* and *Bacillus pyocyaneus.* Other writers have reported cases caused by the *Micrococcus catarrhalis,* influenza bacillus,[2] Friedländer's bacillus, Koch-Weeks bacillus, typhoid bacillus,[3] and the *Bacillus acidi lactici.*[4] Plischke reviewed the records of 1,305 cases of tuberculous meningitis and found no case in any patient less than two months old. Examination of the literature indicates that special significance must be attached to infection by a group of organisms that ordinarily have very little pathogenicity for older persons. This group comprises the colon bacillus and allied intestinal bacteria.[6, 7, 8, 9] Attention was directed to such infections in Europe in 1895 by Scherer,[10] who discussed the possible routes of infection. In our own country Hinsdale[11] reported a case of colimeningitis in a three-day-old infant in 1899 and discussed the possible modes of infection. From then until the present time, the literature furnishes enough case reports to indicate that such conditions are not very rare. It is safe to assume that many more cases have not been reported and that numbers of them have gone undiagnosed. It is also apparent that such infections are almost entirely peculiar to early life. Holt[12] in a review of 300 cases of acute meningitis in infants and young children found practically no cases of *Bacillus coli* infection in patients over six months old. He reported three such infections in babies from eight days to six weeks old.

From the time that the first cases were reported, there has been much discussion of the possible avenues of entrance by the organisms into the body. Suspicion was early directed toward contaminated

bath water from which infection might be introduced through skin abrasions, the umbilicus, external auditory canals, and the mucous membranes of the nose and throat. Scherer expressed the opinion that the infection commonly resulted from contaminated bath water, usually involving the middle ear first and secondarily the brain. Hinsdale felt that his patient was infected through the umbilical cord since the mother suffered from a suppurative endometritis. The instruments and fingers of the obstetrician and midwife were suspected of introducing organisms through the mouth and nasal passages. Moll[13] made a careful study of the condition and concluded that colimeningitis in the newborn was usually secondary to colicystitis. Other investigators have generally rejected this theory. Cases have been reported where the infection appeared to be of antenatal origin. Goldreich[14] reported such a case, the infant dying on the second day. He believed the bacteria might have gained entrance into the uterus in the course of a three days' labor during which the amniotic sac ruptured. According to Braid's[15] report of a case of colimeningitis which developed on the fourth day, smears from the mother's cervix showed the same type of organisms as those recovered from the cerebrospinal fluid of the infant. He believed that the baby swallowed infectious material during birth and that the organisms passed by way of the blood stream from the digestive tract to the central nervous system. This belief that infectious material enters the body through the mouth and digestive tract has been expressed by several writers.[2, 16, 17, 4] La Fetra,[18] however, did not feel that infection was very common through aspiration of contaminated liquor amnii. Koplik[19] reported a case of colimeningitis in a male child who was circumcised on the eighth day and three days later developed a colipyelitis, which was followed by the meningitis one week later. Prematurity and trauma appeared to be predisposing factors in the case observed by White.[17]

Cooke[20] in discussing the possible origin of these meningitis infections advanced certain ideas which offer a satisfactory explanation although he admits that direct proof is difficult. On account of the type of bacteria involved, it is assumed that the organisms are derived from the intestinal tract and reach the meninges through the blood. Kohler[21] expressed similar views and brought out the fact that early blood cultures are frequently positive. Cooke felt that three factors probably play a part. They are: (1) the greater permeability of the intestinal mucosa in early infancy, (2) low resistance at this early age associated with defective antibody formation, and (3) the influence of digestive disturbances and malnutrition in the forementioned factors. The author would add to these what he considers a very important fourth factor, viz., the trauma of the head incident to its delivery through the birth canal resulting in minute tears of the meninges with small hemorrhages. These cause points of least resist-

ance where organisms which are in the circulation may find lodgment and start trouble. The colon group of bacteria can readily be found in the mesenteric lymph nodes and even in the liver of adults. However, they seem to be readily destroyed without the development of any pathologic processes. This is presumably due to the presence of abundant amounts of immune bodies. It has been repeatedly shown that the intestinal tract of the young has a much higher degree of permeability for bacteria as well as unchanged proteins. Coupled with this is the well-known fact that young infants are apt to be low in protective amounts of antibodies against the colon group. Thus, it is felt then that we have a reasonable explanation for the fairly common occurrence of meningitis in the newborn due to infection with the colon group. At the same time we are forced to admit that absolute proof of the correctness of such an explanation is lacking. During birth, or shortly afterward, the intestinal tract of the newborn becomes inhabited by this group of organisms. The immature intestine offers little hindrance to their passage into the circulation. The body of the newborn baby is not plentifully supplied with antibodies against these organisms and prematurity, trauma, malnutrition, starvation, or dehydration may further lessen the quantity. Injuries about the head resulting in tears in the membranes and small hemorrhages offer locations of least resistance where the organisms can lodge and multiply. The result is a purulent meningitis. We believe that this is the modus operandi by which the majority of such cases develop.

Meningitis in the newborn presents no very uniform picture. The outstanding symptoms are fever and convulsions. Examination usually reveals some tension of the fontanels, and there may be some separation of the sutures. A stiff neck is not uncommon. Any or all of the ordinary symptoms seem in older persons may or may not be present. The actual diagnosis is made by examining the cerebrospinal fluid. The characteristic thick, brownish pus described by Michael[22] seems to be typical of the infections by the colon group. Barron and others have pointed out the fact that the colon bacillus may show marked variations in form, in rate of fermentation, and in motility. Cooke[20] called attention to the fact that most of the organisms mentioned in connection with these cases, and designated *Bacillus coli*, have not been described in sufficient detail to determine definitely their identity. It is not unlikely that many of them are members of the group but not identical with *Bacillus coli*. This was true of the case reported here.

The prognosis is uniformly bad. There is no curative treatment. Repeatedly withdrawing the pus gives the infant more comfort and offers the only chance of recovery. Reducing the degree of birth trauma and guarding against exposure, dehydration, and underfeeding should lower the incidence of the disease.

CASE REPORT

V. J. B., a white female infant, five weeks old, was brought to the hospital because of convulsions, vomiting, and a stiff neck.

The family history was unimportant. The mother was a primipara, and the child was born at full term. Delivery was by forceps after a labor of twenty-four hours. A large hematoma located just to the right of the anterior fontanel soon suppurated, was opened and drained pus for a short while. The baby nursed at the breast and did well until three weeks of age when she began to have projectile vomiting and general clonic convulsions. The parents stated that the head was drawn back and the pupils dilated. The convulsions continued to occur at short intervals with periods of freedom which lasted one or two days at a time. She nursed well and did not appear to be very ill, but vomited a good deal.

Examination.—The baby was well developed and nourished with some rigidity of the neck and with wide open, bulging fontanels and sutures. There was a scar on the head at the site of the previous suppurating hematoma and another on the occiput which was obviously the result of the application of forceps. The patellar reflexes were exaggerated and there was a positive Kernig's sign. The examination was otherwise negative. The temperature was 101° F. The leucocyte count was 20,000, with 72 per cent polymorphonuclears. A ventricular puncture produced a turbid fluid with a cell count of 246 with 56 per cent polymorphonuclears. Small, very short, almost coccoid gram-negative organisms were present in smears and readily grew in cultures.

Course.—The child lived about two and a half months after being seen. Large amounts of pus were drawn off at repeated ventricular punctures. The fluid became more purulent and later was thick and had a peculiar acrid, putrid odor. During a great part of this time the condition was good, and there was an actual gain of two and one-half pounds in weight. The head became much enlarged. General convulsions occurred at irregular intervals. She was finally taken from the hospital and died at home at the age of about three months. Since the parents lived in another part of the state, an autopsy could not be obtained.

Diagnosis.—Purulent meningitis due to an unknown organism of the paracolon group, and secondary hydrocephalus.

Bacteriology.—(Miss Ida Lucille Brown, University of Oklahoma School of Medicine Laboratory.) The organisms mentioned continued to be found abundantly in smears and to grow in pure cultures. Lactose, saccharose, dextrose, mannose, mannite, xylose, raffinose and inulin were all fermented with the productions of acid, but no gas. Endo's medium showed red colonies resembling those of *Bacillus coli;* eosin methylene blue showed metallic colonies, also resembling those of *B. coli;* Russell's double sugar agar showed initial acidity in the butt of the tube with an alkaline slope turning alkaline throughout in forty-eight hours. There was no gas produced on this medium. The organism was agglutinated by the patient's serum in a dilution of 1 to 300 but not in higher dilutions. Normal pooled serum taken from a group of medical students showed no agglutinating power for the organism. There was no cross agglutination with the colon-typhoid group which it most nearly resembled. Guinea pigs were inoculated subcutaneously and intramuscularly with the organism with no results except local redness and swelling. Rabbits were injected intramuscularly, intravenously, and subdurally with no results. Cultures were sent to the Laboratory of the Rockefeller Institute and to the Hygienic Laboratory of the U. S. Public Health Service where the findings were similar to those mentioned before. The organism could not be definitely classified, but apparently belonged to the group of saprophytes that are normally present in the intestinal tract.

COMMENT

This case fits in well with what has been said regarding the causative factors. There was a long, difficult labor with considerable trauma to the infant's head. Entrance into the blood stream could have resulted from organisms passing through the intestinal wall or from the suppurating lesion on the scalp. There could easily have been some intracranial injury resulting in one or more points of lowered resistance where the organisms could lodge. The responsible organism was not the colon bacillus, but evidently a member of the colon or some allied group. While a very low degree of virulence was manifested, there was an inability on the part of the child to develop sufficient immunity to overcome the infection.

SUMMARY

Meningitis in the newborn, caused by the colon bacillus and allied intestinal bacteria, while not a common condition, is seen sufficiently often to deserve some attention. These organisms gain access to the digestive tract during or shortly after birth. A highly permeable intestine allows them to pass rather readily into the circulation. A low degree of general immunity offers an insufficient obstacle to their circulation in the blood stream. Intracranial injuries probably result in points of low resistance where the organisms may lodge and cause spreading meningitis.

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THE SCHILLING BLOOD COUNT AS AN AID IN THE DIAGNOSIS OF ACUTE APPENDICITIS IN CHILDREN

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STUDIES of the differential blood smear with special attention to the immature, polymorphonuclear leucocytes, in practically all the known pathologic states, have led to the conclusion that in the absence of infection there can be no appreciable increase in the percentage of immature white cells in the blood. Reports on many thousands of cases have confirmed Schilling's original contention that "a real failure" of the differential smear to indicate the presence of infection in the body "is unthinkable."[1]

Otherwise stated, an absolutely normal smear with no increase in the immature neutrophiles enables one to rule out the presence of an acute infectious process in the body with reasonable accuracy. If repeated counts are normal, there is no acute infection present. This premise, which is vital to the validity of this work, has been amply proved.[1, 2, 3]

Doubtful cases of "appendicitis" frequently occur with abdominal pain and localized tenderness, with or without vomiting, with normal temperature and normal total leucocyte count, in which it is difficult to make a positive diagnosis. The usual white and differential blood counts vary greatly and are of no real significance. These guides are especially unreliable in children. With improved, modern, operative technic, rather than risk costly delay and the rupture of an acutely inflamed appendix, the surgeon feels it safer and wiser to perform an appendectomy in all doubtful cases at the risk of finding a normal appendix, which, as a matter of fact, occurs in about from 30 to 40 per cent of cases operated on for acute appendicitis.[4, 5]

If it were possible, in such uncertain cases, to rule out definitely acute infection, some other explanation of suggestive symptoms might be sought, and many unnecessary appendectomies avoided. Operative technic is not uniformly good, and the dangers of unskilled surgery at inconvenient times are not negligible. A careful examination of the blood smear by the Schilling method, which is not difficult, should unequivocally indicate the absence of an acute inflammatory process in the appendix and thereby minimize unnecessary surgery.

From the A. Jacobi Division for Children of the Lenox Hill Hospital; service of Dr. Jerome S. Leopold.

This can be done only, however, when the percentage of immature white cells in the smear is normal (10 per cent or less in children). The presence of from 10 per cent to 15 per cent of these young forms indicates a mild, acute or subacute catarrhal process. More than 15 per cent of the young cells is definite evidence of infection somewhere in the body. Since the blood differential is not specific, it does not determine the nature of the inflammatory process, whose presence, once indicated, must be located by other signs.

REVIEW OF LITERATURE

Efforts to develop a highly practical application of the Schilling count by establishing the absence of an acutely inflamed appendix in the presence of false, though suggestive, signs led to a study of a series of cases as they appeared in the pediatric wards. When this work was begun, there were no reports of a similar nature in the literature. Since then, however, several observers have published the results of their studies on the Schilling index in acute appendicitis, mostly in adults. My observations in children corroborate those which have recently appeared and should be followed by other studies. If these facts can be repeatedly verified, they are of great practical value.

Yaguda[4] reviewed a series of 671 cases (the ages are not given, but some children must have been included in this number) on which appendectomies had been performed. The blood smears had been examined by the usual method and filed. They were reexamined according to the Schilling classification, and these counts were compared with the histologic findings in each case. These results are of great interest and significance. They are briefly stated as follows:

1. Normal appendices (no evidence of acute inflammation), 277 cases (41 per cent), showed from 2 per cent to 8 per cent stab forms (average 4.3 per cent).

2. Catarrhal appendices (inflammatory process limited to the mucosa) showed 7 per cent to 14 per cent stab cells (average 10.2 per cent).

3. Acute, diffuse, suppurative appendicitis without perforation showed 14 per cent to 28 per cent stabs (average 17.8 per cent).

4. Acute, diffuse, suppurative appendicitis with perforation and peritonitis showed 32 per cent to 47 per cent stabs (average 39.5 per cent).

Yaguda concluded that a normal percentage of immature neutrophile cells ruled out acute appendicitis.

Herz[5] found that in 161 cases diagnosed appendicitis it was possible to establish some other diagnosis in sixty-one cases. In thirty-five cases of appendectomy with histologic specimens, eleven were normal.

He concluded that the Schilling count is invaluabe and with it one can often avoid operation. An acute case of appendicitis never occurs with a normal blood picture.

In a smaller series, containing ten acute cases and thirty nonacute cases, six of the entire group being children, Goodale and Manning[6] found that in cases where the appendices showed a general, polymorphonuclear infiltration, with or without pus in the lumen, there is a definite left shift. Normal cases showed no increase in the immature white cells. They concluded that the Schilling index renders a more accurate picture of the pathology in the appendix than the ordinary differential count.

Luck[7] described the blood picture in appendicitis in ten adult cases and noted that the Schilling count is valuable to determine the presence or absence of an infection in the body. He encountered no infection of any severity in the absence of a shift to the left, regardless of the clinical symptoms or the total leucocyte and polymorphonuclear count.

Prochnow[8] found the use of the Schilling hemogram highly satisfactory diagnostically in acute appendicitis among adults. He noted a marked left shift with increasing severity of the infection.

METHOD AND OBSERVATIONS

On admission a total white cell count and a Schilling differential count were made in every case, prior to operation. Wright's stain was used in preparing the blood smears. If the smears are thin and of even quality, so that there is no clumping or overlapping of erythrocytes, the leucocytes will be well formed and easy to distinguish in any portion of the smear. In a properly prepared specimen crushed elements are only occasional. It is impossible to classify cells with any accuracy in thick preparations, and failure is often due to this fault.

The white cells were tabulated horizontally in the form of a hemogram, as basophiles, eosinophiles, myelocytes, juveniles, stabs, segments, lymphocytes, and monocytes (see Tables I and II). The rarely seen myelocytes, the infrequent juvenile cells, and the common, de-

TABLE I

NONACUTE CASES

CASE	DATE	AGE IN YEARS	HEMOGRAM								PATHOLOGIC REPORT
			B	E	M	J	ST	S	L	MON	
1	10/16/31	8	–	1	–	–	11	55	30	3	Normal appendix.
5	1/ 3/32	8	–	3	–	–	6	37	50	4	Normal appendix.
6	5/28/32	11	–	3	–	–	5	45	44	3	Chronic, thickened mucosa.
13	3/ 7/33	10	–	1	–	–	11	72	14	2	Chronic, kinked, nonacute.
16	3/18/33	11	–	–	–	–	10	62	26	2	Mild, chronic appendicitis.
20	5/ 2/33	11	1	5	–	–	7	38	45	4	Chronic. Serosa smooth.

TABLE II

ACUTE CASES

CASE	DATE	AGE IN YEARS	HEMOGRAM								PATHOLOGIC REPORT
			B	E	M	J	ST	S	L	MON	
2	11/ 5/31	11	–	–	–	–	19	52	25	4	Early acute appendicitis.
3	12/10/31	7	–	4	–	–	12	29	51	4	Chronic, catarrhal, retrocecal; non-acutely inflamed.
4	12/19/31	14	1	–	–	–	26	47	19	7	Acute, exudative; many white blood corpuscles.
7	8/ 6/32	12	–	–	–	–	16	40	40	4	Acute, hemorrhagic; necroses.
8	8/ 9/32	7	–	–	–	–	30	52	15	4	Acute fibrinous exudate at tip.
9	12/10/32	5	–	–	–	1	68	26	4	1	Ruptured; peritonitis.
10	12/29/32	12	–	–	–	1	21	66	8	4	Acute empyema of appendix.
11	1/10/33	8	–	1	–	–	31	52	5	11	Gangrenous, perforated; free pus, adhesions, peritonitis.
12	2/ 8/33	8	–	–	–	–	40	47	10	3	High retrocecal; acute, covered with fibrin.
14	3/10/33	10	–	–	–	–	20	62	14	4	Acute, inflamed, thickened.
15	3/12/33	10	–	–	1	4	51	32	9	3	Acute, suppurative, perforated.
17	3/30/33	8	–	1	–	2	31	35	24	7	Acute, inflamed appendix.
18	4/12/33	5	–	–	–	32	53	11	2	2	Acute, inflamed, ruptured.
19	4/13/33	7	–	–	–	2	39	44	8	7	Ruptured; free pus.
21	5/17/33	12	–	3	–	–	17	29	49	2	Chronic, catarrhal; serosa injected.
22	5/18/33	8	–	–	–	7	34	41	15	3	Ruptured; acute peritonitis.
23	5/19/33	9	–	–	–	–	36	34	24	6	Acute suppurative appendicitis.
24	7/21/33	13	–	–	–	–	15	77	8	0	Acute congestion; necroses; white blood corpuscles in mucosa section.
25	8/10/33	4	–	–	–	–	35	21	39	5	Retrocecal, appendiceal abscess.
26	8/23/33	7	–	–	–	–	39	50	3	8	Acute, suppurative; necroses.
27	8/23/33	12	–	–	–	2	40	28	28	2	Acute, ruptured during removal.
28	8/25/33	12	–	–	–	–	47	35	11	7	Acute, suppurative; necroses.
29	8/26/33	8	–	–	–	–	37	49	7	7	Acute, suppurative; necroses.
30	9/12/33	9	–	–	–	3	32	52	9	4	Empyema of appendix.

Abbreviations: B, basophiles; E, eosinophiles; M, myelocytes; J, juveniles; ST, stabs; S, segments; L, lymphocytes; MON, monocytes.

generated stab or band forms comprise the immature polymorphonuclear leucocytes with nonsegmented nuclei and represent varying degrees of immaturity. An increase in the percentage of this group of cells over normal constitutes a "shift to the left."[9]

In infections of moderate severity the stab forms were increased over normal. As the infection progressed, a further increase in stab forms was followed by the appearance of juvenile cells and, if allowed to continue untreated, resulted in the appearance of occasional myelocytes in the peripheral blood. Though the degree of shift was approximately proportional to the severity of the pathology found, one could not invariably judge the extent of damage in the appendix from the amount of shift. It is important to note, however, that an increase in the immature white cells never failed to indicate the presence of infection.

The segments (the familiar, mature, polymorphonuclear leucocytes with two or more lobes connected by hairlike filaments forming the nucleus) were usually decreased during the acute stage of infection and became more numerous during convalescence. An abnormal increase of the segments with a normal percentage of stabs usually in-

dicated a chronic infection. It is for this reason that a high percentage of polymorphonuclear cells must be examined to determine the number of immature, nonsegmented forms present. One may not assume that a high polymorphonuclear count means a high stab count. Unless acute infection is present, there will be no abnormal increase in stab forms. This important information can only be obtained by grouping the cells according to the presence or absence of filaments in the nuclei.[9]

REPORT OF CASES

In this series of thirty appendectomies, six cases showed normal histologic specimens. In each of these cases the opinion was ventured that a normal, or at least a nonacutely inflamed, appendix would be found and that appendectomy was not urgently indicated. The total white count is omitted in the tables since it played no part in determining the presence or absence of infection. In several instances it was normal in the presence of severe pathology and was therefore regarded as unreliable.

Among the nonacute cases, patients 1 and 13 showed stab counts of 11 per cent. This slight increase over normal was not deemed sufficient evidence of acute infection. Case 13 showed 83 per cent polymorphonuclear cells, of which 72 per cent were mature segments, indicating as the microscopic sections showed, a chronically inflamed organ, but no acute infection. Though Case 3, with a high normal figure of 12 per cent stabs was omitted from the nonacute group, it was felt that no urgency for operation existed though the appendix might be chronically inflamed and better removed. Histologic section indicated this.

CASE 1.—Patient, aged eight years, gave a history of pain in the right upper quadrant, of twenty-four hours' duration, growing worse and appearing in the left lower quadrant. There was no vomiting. There was tenderness in the right lower quadrant. Other examination was negative. The temperature was 99° F. The total leucocyte count was 12,400. The Schilling smear showed 11 per cent stabs, and operation was deemed unnecessary, as infection was not shown to be present. Appendectomy was performed, and a normal appendix was removed.

CASE 6.— Patient, aged eleven years, was ill for six days with pain in the right abdomen. The patient was nauseous but did not vomit during this period. The bowels were regular. There was no fever. There was slight tenderness and spasm over the right rectus muscle. The total white cell count was 11,000. There were 5 per cent stabs in the smear. With this count there could be no acute or subacute infection in the body and operation was deemed unnecessary. The pathologist reported a thickened mucosa with no necroses and made a diagnosis of chronic appendicitis.

CASE 13.— Patient, aged ten years, complained of pain in the right side for two weeks. There was no vomiting. Examination revealed marked tenderness on moderate pressure in the right lower quadrant, especially over McBurney's point. The rectal examination was negative. The temperature was 100° F. The child

was apprehensive and neurotic. With the temperature approximately normal and no other apparent cause for the pain, the stab count was useful in indicating the absence of an acute inflammatory process. The smear showed 11 per cent stabs—a high normal. There were, however, 72 per cent segments as well, suggesting a subacute process. A slightly injected appendix was removed. Section showed two small, superficial ulcerations without inflammatory infiltration—considered subacute. Though this appendix was undoubtedly better out of the body, the count correctly indicated no acute inflammation at the time of operation, and no surgical abdomen.

CASE 20.—A girl, aged eleven years, had pain in the right lower abdomen and nausea without vomiting for three days before admission. This pain had recurred at intervals for the past three weeks, but the present attack was the most severe, and the child could hardly sit or stand. The temperature was 99° F. There was definite tenderness on moderate pressure over McBurney's point. Rectal examination verified this tenderness on the right side. The white count was 16,000. There were only 7 per cent stabs, however. A diagnosis of acute appendicitis was made despite the normal differential, though it was argued there could be no acute process with this count. Appendectomy was performed a few hours after admission, and a grossly normal appendix was removed. The pathologist reported a chronic catarrhal appendicitis with a smooth, glistening serosa and a slightly injected mucosa intact.

COMMENT

It can thus be seen from these findings and other reported cases that a count of the immature, nonsegmented, polymorphonuclear leucocytes in the differential blood smear is particularly useful in ruling out acute appendicitis and the need for immediate surgery in cases with false symptoms and signs, where the temperature is normal. In the presence of fever there is usually an increase in the stab forms, and one cannot know whether the appendix or some other part of the body is responsible for the shift. Regardless of the total white cell count or other suspicious signs, a normal percentage of stab cells indicates the absence of acute inflammation in the body and relieves the patient of the need for urgent laparotomy.

It has been shown that in over 30 per cent of the appendectomies performed, normal appendices have been removed for want of an accurate guide as to the actual presence of inflammation. These unnecessary operations can be safely obviated by a more general use of the Schilling index.

In practice, if a case with suggestive signs shows a count of more than 10 per cent stab cells, one should ignore the count and follow the signs. There may be acute appendicitis present. If it shows less than 10 per cent stabs, acute appendicitis is hardly possible.

SUMMARY

Thirty cases diagnosed as acute appendicitis and operated on for this condition are described and discussed with special reference to the significance of the percentage of immature, nonsegmented, polymorphonuclear leucocytes in the blood stream.

Of these thirty cases, histologic specimens in six were those of normal or nonacutely inflamed appendices, accurately judged by the Schilling count before operation.

A table of the whole series with the hemogram and important pathologic findings in each case is given.

Though this group of cases is small, similar results have been described in adults. The practical importance of the conclusions arrived at justify further observations on the correctness of these results.

CONCLUSIONS

The Schilling differential smear is accurate in determining the absence of acute appendicitis in the presence of falsely suggestive symptoms and signs where the temperature is normal, regardless of the total white count.

In so far as this information cannot be obtained with the ordinary examination of the blood smear, the Schilling method is far more valuable and should replace the older count.

The routine use of the Schilling index in the future should materially reduce unnecessary appendectomies and the consequent risk incurred.

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THE COMPLICATIONS OF RETROPHARYNGEAL ABSCESS

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ONE obtains the impression from textbooks that retropharyngeal abscess is a rather simple condition. No stress is laid upon its complications or on the possibility of serious trouble that may occur in treating this disease. Perhaps because of this attitude little attention has been paid to the reports of isolated cases, or groups of cases, in which death and difficult complications have been described.

When retropharyngeal abscess is kept in mind as a possibility, there is no condition in infancy and childhood easier to diagnose. Yet it is a fact that it is frequently overlooked. It does not always present the classical symptoms of choked-up cry, difficulty in swallowing, retracted head, noisy breathing, and cervical adenitis. The following is a list of the complications which may occur in retropharyngeal abscess. It affords an outline of the difficulties met with in this condition in our own cases and those reported by others.

COMPLICATIONS OF RETROPHARYNGEAL ABSCESS

1. Death.—
   - a. Death unrelated to hemorrhage or rupture of the abscess
     - (1) Spontaneous sudden death
     - (2) Death at or shortly following the time of incision
   - b. Death due to rupture of the abscess contents into the larynx
   - c. Death due to hemorrhage
2. Hemorrhage.—
   - a. Primary (before incision)
   - b. Secondary (after incision)
3. Rupture of the abscess contents into the
   - a. Throat
   - b. Larynx
   - c. Mediastinum
   - d. External auditory canal
   - e. Internal auditory canal
4. Other complications.—
   - a. Facial paralysis
   - b. Esophageal paralysis
   - c. Pyemia
   - d. Septicemia
   - e. Thrombosis of the internal jugular vein
   - f. Pneumonia
   - g. Lung abscess
   - h. Edema of the glottis

From the Pediatric Service of The Brooklyn Hospital, Dr. A. D. Smith, Director.

CASE 1.—Sudden Death Following Incision of a Retropharyngeal Abscess.—

D. K., female, aged eleven months, had bronchopneumonia which was suspected of being tuberculous because of her poor development and positive tuberculin reaction. There was evidence of rickets clinically and roentgenologically. A large retropharyngeal abscess (left) was discovered and incised through the pharynx with the liberation of blood and pus. No anesthesia was used. After incision, she suddenly ceased breathing. There was no respiratory difficulty noted. Efforts at resuscitation were without avail. Autopsy showed no cause for sudden death, such as laryngeal obstruction or status lymphaticus. The mediastinal lymph nodes were tuberculous. There were isolated tubercles in the spleen, liver, and kidneys. There was no caries of the spine.

CASE 2.—Death Eight Hours After Incision of a Retropharyngeal Abscess.—

A thirteen-month-old female entered the hospital with a diagnosis of pneumonia and rickets. A retropharyngeal abscess was discovered three days after admission and was opened by a sharp finger nail, with liberation of about a teaspoonful of pus (thick greenish). The child died suddenly about eight hours later while the nurse was washing the mouth with saline. There was no evidence of choking. The respirations stopped suddenly, but the heart continued to beat some minutes. Efforts at resuscitation were without avail. No autopsy was obtained.

That sudden death may occur in adults as well as children is attested by the following:

CASE 3.—(From the Otolaryngologic Service by permission of Dr. Claude G. Crane, Chief.) D. G., female, twenty-one years old, was seen by the Otolaryngologic Service on the emergency ward with marked swelling of the right side of the neck of four days' duration, following a tonsillitis of two weeks' duration. She was one month postpartum. Some dyspnea was present and a retropharyngeal mass was evident. Without anesthesia a blunt scissors was introduced into the abscess through the mouth. Almost immediately the dyspnea became very severe, and cyanosis set in. Tracheotomy was done and artificial respiration instituted but to no avail. No autopsy was obtained.

COMMENT

When death follows immediately upon the incision of a retropharyngeal abscess, in our cases at least, it occurs too quickly and with too little evidence of choking to warrant attributing the cause to suffocation, either by undue pressure in the laryngeal region or by aspiration of the abscess contents. Though our present knowledge is not sufficient to explain the cause of death, shock in some way related to vagal or sympathetic stimulation probably plays an important part. In the light of these fatalities what measures can be instituted to reduce the possibility of their occurrence? As long as the exact cause of death is not known, one cannot know fully how to prevent them. It would seem wise, however, that the operation for the incision of retropharyngeal abscess should not be lightly undertaken and done anywhere. The out-patient clinic in particular appears to be a poor place to do it. The struggle incident to opening the abscess particularly in chil-

dren should be minimized. Preparation for the incision by administration of a mild sedative might minimize the shock. The use of a mouth gag may be a source of danger.

Bokai[1] describes a case of a four-month-old male infant who immediately after incision "instead of the usual coughing and choking, stopped breathing, became cyanotic and then deathly pale; the heart was scarcely heard, the pulse not palpable. The child was resuscitated by electric stimulation of the phrenic nerve with an induction apparatus."

The same author reports another case in an eleven-month-old girl. "Following a second opening of the abscess in the throat, the respirations ceased, the child lay lifeless. The electric current was successfully used to stimulate respiration, and the child was revived. Pneumonia set in and the child recovered only after a long stormy pneumonic course."

Piatot and Variot[2] reported the death of an infant with retropharyngeal abscess at the moment of incision. In this case death did not occur from aspiration but from "reflex syncope." They suggest that pressure on important sympathetic and vagus fibers may be a factor.

Chamberlin[3] reported a case of sudden death in retropharyngeal abscess on the insertion of a mouth gag before the abscess could be incised. After death, incision revealed a large amount of pus. Holt[4] reports: "We have known unexpected death to occur in two cases shortly after opening the abscess, apparently from shock, which in these patients is sometimes very great. In one case death was due to a secondary retroesophageal abscess."

SUDDEN DEATH DUE TO SPONTANEOUS RUPTURE OF THE ABSCESS

Although some authors, as Koplik,[5] have felt that there is no urgency about incising a retropharyngeal abscess, and while it is doubtless true that many rupture spontaneously without disastrous results, there are, nevertheless, a sufficient number of sudden deaths from spontaneous rupture reported to warrant the utmost caution.

Bokai[1] reported a case of a female, six months old, whose sudden death was due to rupture of the abscess into the larynx. "The mother, despite the threatened danger, refused incision and insisted on waiting another day. The patient died the following night of asphyxia."

Justi and Gaupp[6] reported cases of suffocation through spontaneous rupture of the abscess. Charlton[7] reported sudden death due to asphyxia following spontaneous rupture in a boy, eight years old. The condition followed two weeks after tonsillitis, which had apparently subsided, and the boy was sufficiently able to attend school the day before death.

Brown[8] reported a case of an infant, six months old, who following a cold had some respiratory embarrassment and difficulty in feeding. On the day of his death the baby had a violent choking spell during which it coughed up a considerable amount of pus and then ceased breathing. Examination after death showed a large abscess cavity in the posterior pharyngeal wall.

DEATH DUE TO HEMORRHAGE

To the danger of asphyxia from spontaneous rupture is to be added the risk of severe hemorrhage by erosion of the carotid vessels. Death due to hemorrhage may occur before or after incision. When hemorrhage occurs, it is usually severe. Nineteen of twenty-three cases gathered by Lifschutz[9] from the literature resulted fatally. Of his cases six had spontaneous hemorrhage, twelve were secondary to operative procedure, three were traumatic, and two were not described. Wishart[10] reported a case of sudden death from primary hemorrhage in an infant, two weeks old, following a sore throat. Cervical adenitis had been present but subsided. Two severe hemorrhages occurred, and the child died suddenly. Autopsy showed "the wall of the internal carotid artery was eroded for a distance of about 2 cm. and lay on the posterior wall of the (abscess) cavity."

Lifschutz[9] reported a case of retropharyngeal abscess in a three-year-old boy, who was seen on the fifth day of illness and in whom incision was refused. Four days later the child had a profuse primary hemorrhage and died from exsanguination. No autopsy was performed, but the abscess cavity was filled with recently clotted blood.

Lidell[11] (case of boy fifteen years old), Bokai,[1] Carmichael[12] (case of infant six weeks old), Kaufman,[13] Wylie and Wingrave,[14] Travers,[15] Frank,[16] Klug,[17] and others have reported cases of fatal hemorrhage from the carotid artery. In two of Frank's cases, death occurred despite efforts at ligation. In Wylie's and Wingrave's cases hemorrhage occurred in a woman, aged twenty-one years, nine days after operation. Klug's patient, a girl, aged twelve years, suffering in addition from a generalized tuberculosis, died from exsanguination ten minutes after the onset of the bleeding, which developed on the second day following the incision.

Since death may occur suddenly in a retropharyngeal abscess either from spontaneous rupture or from spontaneous hemorrhage, the question arises as to whether we shall treat the condition as an emergency and incise the mass once it is discovered or treat it as an abscess occurring in any other part of the body. There is no way at present to differentiate the case which may give difficulty although the use of the x-ray to determine the extent and location of the swelling may prove helpful.

Many factors, such as the degree of respiratory embarrassment, the difficulty in taking food, the degree of toxicity, the state of nutrition, the stage of the abscess in the throat, must govern the decision. Definite fluctuation should preferably be present, and above all the incision must be carefully done as a major operative procedure. Adequate drainage must be afforded, remembering that pocketing may occur and that the mass may extend into the mediastinum.

LIGATION OF CAROTID TO SAVE LIFE AFTER SEVERE HEMORRHAGE

Ligation of the common carotid and occasionally of the internal jugular vein have been reported as life-saving measures. Travers[15] successfully ligated the internal jugular and common carotid in a case of severe secondary hemorrhage. Pearson[18] ligated the internal jugular vein successfully. Liang[20] and his coworkers successfully tied the left common carotid in a woman in whom bleeding occurred on the seventh day following incision of the abscess.

When severe bleeding occurs in the presence of a retropharyngeal swelling, either prior to or after incision, there is every indication to treat the case as an emergency. Ligation of the common carotid artery on the affected side should be done at once, for at any moment the hemorrhage may recur, perhaps with fatal outcome. Franklin,[19] however, reported a case of spontaneous recovery of a child, aged seven years, with an abscess eroding the left internal carotid.

THROMBOSIS AND SLOUGHING OF THE INTERNAL JUGULAR VEIN

Mosher[21] has reported a case of a man who began to run a septic temperature with chills one week after successful drainage of a retropharyngeal abscess. The swelling of the neck increased, and on operation 4 ounces of foul pus were evacuated from the posterior portion of the carotid sheath. The internal jugular vein was found thrombosed, and two inches of the vein were sloughed away. The patient died on the table.

RUPTURE OF THE ABSCESS THROUGH THE EXTERNAL EAR CANAL

Although this mode of termination of the retropharyngeal abscess is not very uncommon, reference to most of the standard textbooks finds no mention of it. Bokai[1] reported a case in a two-month-old infant he had seen in 1873. "Pressure on the swelling in the throat produced a discharge of pus not only through the original opening but also through the left ear canal."

Two of our cases terminated in a similar rupture through the external ear canal.

CASE 4.—Baby M. C., a girl, eighteen months old, had a draining left ear for four weeks, with temperature, for which a left simple mastoidectomy was done. Recovery ensued, but one week later the temperature again rose and a left cervical adenitis developed. There was no difficulty in swallowing. After about one week of temperature with little or no symptoms, bogginess of the posterior wall of the pharynx was discovered. While under observation for this condition the cervical adenitis became worse. After a few days during which time no definite fluctuation could be made out in the throat, a thick greenish pus began to discharge from the left ear. This was puzzling at first for the ear had been previously negative following the mastoidectomy. Pressure on the outer cervical swelling and on the mass in the throat both produced a welling up of pus into the external canal. The following day the retropharyngeal abscess was incised in the throat with liberation of the same thick greenish pus mixed with blood. Recovery was uneventful and rapid.

CASE 5.—Baby G., female, nine months old; at the onset of illness there was mild temperature, acute pharyngitis, and a slight cervical adenitis. The temperature persisted and was always of low grade. The cervical swelling subsided and became practically negligible. About two weeks after the onset of illness, the infant began to refuse all food. The temperature rose to 102° F., and on occasions, higher. Both ears were slightly injected. A small hazelnut-sized swelling was present in the pharynx more toward the right side. Definite fluctuation was present. A throat consultant advised of the fluctuation believed it would be as well to wait overnight. Early the next morning the mother called to say the "ear had opened" and the child was much improved. Examination revealed a thick greenish purulent discharge from the right ear. Pressure on the pharyngeal mass caused the pus to well from the external canal from a point about halfway from the external meatus. The eardrum was injected but intact. Without further treatment except daily expression of pus through the ear canal by gentle pressure in the throat, recovery ensued in a few days.

Lyman[22] reported a case of a male adult with rupture through the external canal at the time of operation for a mastoid condition. After the operation improvement was slow until the retropharyngeal abscess was incised in the throat. Pope[23] reported two cases rupturing into the external ear canal. One in a child of eight years and a second in a woman. Both perforations occurred at the junction of the bony and cartilaginous portions of the canal. Bertoin[24] reported a case of rupture into the external auditory canal in a girl, aged ten years, just as the surgeon was exploring the mass in the throat for the point of most fluctuation. Recovery was spontaneous. Doubtless this method of termination of a retropharyngeal abscess is not very rare. It should be kept in mind whenever a very abundant discharge suddenly appears in the external canal, which, when wiped out, promptly fills with pus again. In our cases the purulent discharge differed in character from that seen when the pus came from the middle ear. The pus was thicker and greener than the glaring mucopurulent discharge of a draining middle ear.

MULTILOCULAR RETROPHARYNGEAL ABSCESS

CASE 6.—R. R., aged ten months, developed an acute pharyngitis and left otitis media followed by a large cervical swelling on the side of the discharging ear. The temperature fluctuated between 101° F. and 103° F. for two weeks. Under local treatment the cervical swelling almost entirely subsided, but the temperature continued. Though the child refused food, there was no apparent difficulty in swallowing. The breathing was never labored or noisy though the respirations were somewhat increased. Regurgitation through the nose had occurred shortly after the onset of the illness but only on one occasion, and the mother did not deem this important enough to communicate to the attending physician. The child was treated for pneumonia. Physical examination the third week showed an acutely ill, restless child with increased respirations but no difficult or noisy breathing. The head was not retracted. There was little or no cervical adenitis. Digital examination revealed a slight bogginess in the pharynx, but no definite mass could be palpated. After from forty-eight to seventy-two hours, a very definite bulging mass was felt deep in the pharynx, extending below the finger's reach. At this time, breathing had become somewhat labored, and the cry was distinctly hoarse. A throat consultant was called, who incised the abscess without anesthesia or the use of a mouth gag, the head of the patient hanging over the table. At first only about ½ dram of green pus with very little blood was obtained. Not satisfied that the main body of the swelling had been drained, a clamp was inserted quite deep and spread. There was a gush of pus-tinged bloody material, and about two or three ounces removed. Bleeding was free for a few minutes causing some concern but stopped spontaneously. There was noted improvement in the child's cry, soon after. Two or three days later the temperature subsided, but throughout the period of convalescence there was an aspiration gagging at the end of drinking. While swallowing proceeded, there was no choking but with the swallowing of the last mouthful gagging always occurred. This did not clear up for one week after incision. Recovery was otherwise uneventful.

COMMENT

This case is instructive in several ways. As a diagnostic problem it gave difficulty because at the time of the development of the retropharyngeal abscess there was a very slight cervical adenitis with an absence of other symptoms usually associated with retropharyngeal abscess, namely, retracted head, noticeable difficulty in swallowing, and noisy respiration. The condition was discovered only in the course of a complete physical examination to ascertain the cause of unexplained temperature. From a therapeutic standpoint, the extension of the abscess into the upper mediastinum might readily have proved fatal if complete evacuation was not given. It suggests a bilocular collection of pus and prompts the feeling that this may be the type of case that goes on to fatal termination despite what is believed to be relief by incision. The operator must feel sure by digital examination afterward that sufficient evacuation has been accomplished.

OTHER COMPLICATIONS

Among the rarer complications of retropharyngeal abscess, Szmurlo[25] reported a case of spontaneous rupture of the abscess intracranially

through the internal auditory canal. Lung abscess is reported by Brooks[26] quoting a case of Wegner. Sepsis with fatal termination is also reported by Brooks. Thrombosis of the internal jugular vein is reported by Frank,[16] Glogau[27] and Waldapfel.[28] Bokai[1] reported facial paralysis complicating retropharyngeal abscess. His patient, a nineteen-year-old boy, was unable to swallow for some days following his throat condition and had to be fed by means of a tube.

Spingarn[30] reported edema of the glottis in a boy, fourteen months old, which terminated in recovery. The same author also reported death due to pyemia in a girl, thirteen months old. He believes that early diagnosis and drainage might have avoided the complication as the condition was discovered eight days after the onset. In a third case he reported bradycardia in an eight-year-old boy with a pulse rate of 58 and a temperature of 103½° F. Spingarn believed this due to pressure on the vagus.

SUMMARY

In puzzling cases of unexplained temperature in infants and children, despite the absence of suggestive symptoms of retropharyngeal abscess, digital examination of the throat should be made. To look at the throat is not sufficient. Because retropharyngeal abscess often goes undiagnosed and the patient is treated for other conditions, it does not necessarily follow that the mass found on digital examination of the throat has been present for a long period. We are all familiar with the rapidity with which a cervical adenitis may show itself. Often overnight there may be a marked enlargement of the gland. In the same way a retropharyngeal lymphadenitis which has previously manifested itsef by a slight bogginess in the pharynx may flare up in a period of from twenty-four to forty-eight hours to produce a true retropharyngeal swelling. For this reason a single, or even two or three consecutive daily examinations of the throat are not sufficient to exclude definitely retropharyngeal abscess. The throat must continue to be observed during the febrile period when the cervical adenitis persists and in certain cases even when it has greatly diminished in size or has disappeared. As great a source of error as any in our experience has been the failure to consider seriously the presence of retropharyngeal abscess because of a subsiding cervical adenitis. Therefore, whether a large swelling of the cervical glands is present or not, the presence of temperature not satisfactorily explained in a young child is an indication for digital examination of the throat. It is important in such examination that the finger not only be carried down toward the glottis but also upward to the posterior pharynx.

Death from retropharyngeal abscess has occurred from rupture of the abscess into the larynx and from hemorrhage from the carotid artery. Sudden death at the time of the incision, or shortly after, has been reported.

Hemorrhage complicating retropharyngeal abscess may be primary, before the incision is made, or secondary, after the incision is done. Primary bleeding usually occurs in cases of longer standing, the time allowing for prolonged action of the burrowing infection in the region of the carotid sheath. If the bleeding is severe and prolonged, it may result in collapse and death. Secondary bleeding is usually late in appearing, coming on several days after the incision at a time when most of the danger is believed past. Several cases of recovery following carotid ligation have been reported. When severe hemorrhage occurs in the presence of retropharyngeal abscess before or after incision, ligation of the common carotid artery on the affected side should be done as an emergency measure. Even should the bleeding stop spontaneously, there is always the danger of recurrence, perhaps with a rapidly fatal outcome from exsanguination.

Though many cases of retropharyngeal abscess rupture spontaneously without disastrous result, a sufficient number of sudden deaths have been reported to warrant great care. It is not necessary, as a rule, to treat retropharyngeal abscess as an emergency and to incise is as soon as it is diagnosed. The same rules governing suppuration elsewhere in the body pertain to this condition. Definite fluctuation should preferably be present, and above all the operation should be carried out as a major procedure. Retropharyngeal abscess may rupture spontaneously into the external auditory canal, and this mode of termination is probably not very uncommon.

CONCLUSIONS

1. The complications of retropharyngeal abscess are not as rare as they are ordinarily believed to be.

2. Sudden death unrelated to rupture of or hemorrhage from the abscess has been reported.

3. Death due to hemorrhage, either primary or secondary, may occur. Secondary hemorrhage tends to occur some days after the incision of the abscess.

4. Ligation of the carotid artery has been successfully done in hemorrhage from retropharyngeal abscess. It should be done as an emergency measure whenever bleeding occurs from the abscess.

5. Death due to rupture of retropharyngeal abscess contents into the larynx may occur.

6. The time to incise a retropharyngeal abscess is governed by many factors. Fluctuation should preferably be present, and evacuation

should be complete; it should be remembered that multilocular collections of pus may be present.

7. A prolonged unexplained temperature is an indication for a digital examination of the throat, and this examination should be repeated daily unless the temperature has been otherwise satisfactorily explained.

8. The absence of or subsidence of a cervical adenitis does not exclude the presence of a retropharyngeal abscess.

9. Rupture of retropharyngeal abscess into the external auditory canal may occur, and cases are described.

10. Rarer complications of retropharyngeal abscess are discussed.

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THE EFFECT OF EXTRACT OF PREGNANCY URINE UPON HYPOPITUITARISM IN THE MALE

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IN THE past decade a great interest has been manifested in the field of endocrinology. A more advanced knowledge of the normal physiology of the hypophysis, adrenals, and gonads is making possible a more intelligent understanding and treatment of various endocrine disorders. Since many of the endocrine disturbances arise in infancy or early childhood, a great responsibility falls upon the pediatrician for their early recognition and treatment: thus the early recognition of hypofunction or dysfunction of hypophysis might prevent the unhappy state of dwarfism, sexual infantilism, various menstrual disorders, certain cases of sterility, obesity, etc., in later life.

The epochal works of Evans, Zondek and Aschheim, Allen and Doisy, and others, are largely responsible for the advancement in our knowledge of the function of the hypophysis and the hypophyseal-gonadal relationship.

In 1921 Evans[1] isolated from fresh bovine anterior lobe the growth hormone of the pituitary gland. Extensive experimental work on laboratory animals has since shown its effectiveness.[2, 3, 4, 5, 6, 7] Hypophysectomized rats and mice have served as excellent test animals for determining the growth promoting property of Evans' extract, as they have been found to be more sensitive to the growth hormone than normal ones. Complete ablation of the glands results in an abnormal reaction in different animals. Most hypophysectomized animals die of cachexia (cachexia hypophyseopriva) before a normal life span is reached. The most impressive immediate effect is the failure of the animals to grow. In many hypophysectomized rats and puppies, the administration of the growth hormone has maintained normal stature and in some cases resulted in excess of normal. Putnam, Benedict, and Teel[8] in Cushing's laboratory produced acromegalic changes in a normal English bulldog treated for over one year by injection of anterior lobe pituitary extract. In the human being Cushing,[9] Engelbach,[10] and others have stimulated growth in pituitary dwarfs by the use of potent anterior lobe extracts.

More phenomenal than the failure of growth, is the failure of genital development in the hypophysectomized child (for pituitary

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tumor) and the retrogressive changes in the genital system of adults. Atrophic changes are observed in the testes, prostate, and seminal vesicles; in the female, similar recessive changes are found in the uterus, tubes, and ovaries. Clinically, Simmond's disease[11, 12] presents the changes. Hypophyseal cachexia in a young child with intact hypophysis has been observed by Goebel.[13]

That the development of the gonads and the secondary sexual characteristics are independent of the growth factor of the anterior lobe of the pituitary is now evident. The sex hormone of the hypophysis was first detected in 1926 when Zondek[14] and Smith[15] in this country independently found that subcutaneous implants of anterior lobe pituitary tissue into immature rats and mice provoked sexual maturity in these animals in from three to five days.

Just as it is possible to extract the growth hormone from the anterior lobe of the pituitary, so also is it possible to extract the sex or gonadotropic hormones.[16, 17, 18] However, a more convenient source of the sex hormone was thought to have been discovered by Aschheim and Zondek[14] in pregnancy urine. Zondek and others discovered that estrin, the follicle-ripening hormone secreted by the ovary, is found in large amounts in the body fluids, blood and urine, during pregnancy, and also in the placenta. It has long been known that the hypophysis hypertrophies during pregnancy. With this physiologic phenomenon in mind, it was hypothesized that there also would be an increased secretion and elimination of anterior pituitary sex hormone during gestation. It was found that the "anterior pituitary sex hormone" (prolan) appeared in the urine during pregnancy in large amounts and much earlier than the ovarian hormone—as early as twenty-one days after coitus and, therefore, afforded a means of diagnosing pregnancy early.

Because of its greater solubility in organic solvents, the ovarian hormone is separated from prolan without difficulty.

At the present time there is a great deal of controversy as to the origin and nature of prolan. Phillip[20] and Collip[21, 22, 23] believe that prolan originates in the placenta and is not secreted by the anterior lobe of the hypophysis. Evans,[24] as a result of recent investigations, is of the opinion that prolan originates in the hypophysis. He found that there was prompt appearance of prolan in the blood and urine of males or females after complete surgical ablation of the gonads; but to further substantiate his contention, simultaneous hypophysectomy and gonadectomy must be performed. Zondek[25] believes that the site of origin of prolan is in the anterior lobe and concludes that it arises in the basophilic cells.

Since the discovery of prolan, a great deal of experimental work has been done to observe its effect upon the genital system of immature male and female hypophysectomized and nonhypophysectomized animals.

EFFECT OF PROLAN ON THE GENERATIVE TRACT OF LABORATORY ANIMALS

A great deal of investigative work has been done on the effect of extracts of the anterior lobe of the pituitary and of pregnancy urine upon the genital system of mature and immature animals, for the most part, mice and rats. Chief among the investigators are Smith and Engle, Steinach and Kun, Fels, Brouha, Hinglais and Simonnett, Bourg, Boeters, Boist, Döderlein and Gostimirovic, Neumann, Peter, Kraus, Novak, de Jongh, and Moore.[26] The only uniformity of agreement of investigators as to the effect of anterior lobe extracts and prolan is that neither initiates premature development of spermatozoa and that animals which have been treated do not mate. Engle[26] drew the following conclusions from a summary of his own and the work of others accomplished in this field. "1. The testis weight of animals treated with either concentrated urine of pregnancy or with pyridine extract of sheep glands is considerably increased. 2. The increase in the interstitial cell mass after anterior pituitary extract is slightly greater than the untreated control, but after concentrated urine of pregnancy the hypertrophy is very greatly increased. 3. Neither of these degrees of change has been noted following fresh implants. 4. The failure to induce accelerated spermatogenesis is uniform with the findings after implants, although tubule size is greater than the control on implanted rats."

Engle[27] working with monkeys, corroborated the work in lower animals, namely: increase in size of testes due to tubule growth and an increase in the interstitial cell mass was greater with pregnancy urine than with anterior lobe extract. In no instance (Boeters) was there extensive erosion of the germinal epithelium. The seminal vesicles and the prostate treated with pregnancy urine were much more enlarged than the controls. Working with another series of monkeys, Engle[28] found that injections of extracts of pregnancy urine and water-soluble extracts of anterior pituitary produced descent of the testes in ten immature macacus monkeys. The testes became enlarged; the scrotum grew, and turgescence became evident. During the course of the injections, the scrotum increased in fullness even before the testes had descended into the sac. In a few days scrotal and peripenile areas became turgescent and attained relatively large proportions, the scrotal skin becoming stretched and taut. The scrotal sac was filled with a mucoidlike tissue.

Engle[28] states that the scrotal response in monkeys is similar to that obtained in the human newborn, in which the factors are identical—the hormone from the maternal circulation or placenta in its own blood comparable to that injected into experimental animals. He further states that the human is the only organism in which the testes descends at birth, and the human female is also the only one which is known to have the gonad-activating principle in the circulation throughout the period of gestation. He concludes, therefore, that this hormone is involved in the natal descent of the testes in the human.

In view of Engle's statement, it seems logical to assume that where undescended testes are present in the newborn, excluding faulty development, one factor appears to be important and that is insufficient gonad-activating principle secreted by the mother. A worth-while study, therefore, would be one correlating the relationship of endocrine (pituitary or pituitary-gonadal) dyscrasia during pregnancy with undescended testes in the newborn. It is possible, also, that the underdevelopment of the genital system in hypopituitary states in children may be a result of insufficient pituitary-activating principle inherent at birth, the symptoms not becoming manifest until late childhood or adolescence when the secondary sex characters should develop. The frequent history of endocrine disturbance in the mother previous to or during pregnancy supports this contention.

Our work was stimulated largely through the work of Engle with the macacus monkey. We realized that spermatogenesis normally does not usually occur before the age of from fifteen to eighteen years; rarely has it been known to occur before fourteen years. We were primarily interested, therefore, in ascertaining whether extract of pregnancy urine would cause enlargement of the testes, descent of the testes, and growth and turgescence of the scrotum in male children presenting the picture of hypopituitarism. We were also interested in observing the effect of the injections upon the secondary sex characteristics, body growth, obesity, and metabolism.

Since beginning our work in September, 1932, we have been further encouraged by the recent report of Smith and Leonard.[29] Using antuitrin-S in hypophysectomized rats, they state that spermatids and even sperm may be formed although none were present at the time treatment was instituted. When injections were begun at the time of hypophysectomy, regression in the weight of the testes was slowed and enlargement sometimes was found. Atrophy of the tubules was retarded and mature sperm continued to be present for a longer period than in the untreated hypophysectomized litter mates. They concluded that "these results suggest that a beneficial effect on spermatogenesis might result from pregnancy urine injection in cases of pituitary insufficiency."

MATERIAL

In this study, eight male children were selected; their ages ranged from five and one-half years to fifteen and one-half years at the onset of treatment. All were diagnosed hypopituitarism by means of their clinical features and laboratory data.

The purpose of this study is to determine the effect of "anterior pituitary sex hormone" of pregnancy urine upon genital development, obesity and weight increase, growth of stature, and upon metabolism.

The treatment consisted of the hypodermic administration of antuitrin-S* three times weekly in the dose of 100 R.U. for a period of from three to six months. In one instance this therapy was complemented by the oral administration of desiccated anterior lobe pituitary.

Five patients were seen and cared for in the Mandel Clinic of the Michael Reese Hospital, Chicago. Three cases were seen in private practice and were referred to us through the courtesy of Dr. Julius H. Hess. Each of the five patients observed in the clinic received a complete blood count, urinalysis, blood chemistry including NPN, cholesterol and sugar tolerance determination, basal metabolism, and x-ray of the sella turcica. At the termination of treatment, all laboratory work (except x-ray) was repeated. In all cases weights and complete measurements were recorded at frequent intervals and particular notice was made of appearance of the secondary sex characteristics, genital growth, and fat distribution.

RESULTS

Effect Upon Genital Development

CASE 1.—A. W., aged thirteen years.

History.—Obese, undescended right testis, easily fatigued, poor progress in school; birth weight 7½ pounds; early development normal. Sixteen-year-old sister weighed 169 pounds; mother overweight (165 pounds).

Examination.—Pituitary type of obesity, undescended right testis, left testis at internal ring and underdeveloped, penis and scrotum underdeveloped.

Treatment.—Antuitrin-S, 100 R. U., three times weekly for four months and then 200 R. U. three times weekly for two months.

Results of Treatment.—At the end of three months' treatment, right testis was palpated in scrotum, smaller than the left; left testis in scrotum. At the end of six months, both testes and scrotum were larger. No increase in size of penis. Pubic hair began to appear; voice deepened; he was having erections but no emissions.

CASE 2.—J. M., aged twelve years.

History.—Overweight, tired on slight exertion, and did not play with other boys; birth weight 8 pounds; delivery normal; overweight during infancy; early development otherwise normal. Family history negative.

*Antuitrin-S was supplied by Parke, Davis and Company through the courtesy of H. M. Letton.

Examination.—Pituitary type of obesity, marked pectoral and girdle obesity, effeminate appearance, soft voice; sparse pubic hair, testes small, descended; penis underdeveloped, length 4 cm.; occasional erections, no emissions.

Treatment.—Antuitrin-S, 100 R. U., three times weekly for six months.

Results of Treatment.—At the end of six months, genitals were enlarged to adult size, pubic hair abundant, frequent erections, occasional nocturnal emissions, voice deeper, increased activeness.

CASE 3.—W. T., aged ten years.

History.—Overweight since infancy. Birth weight 12 pounds, instrumental delivery. Sister, eight years old, has been becoming obese in the past six months; sister, two and one-half years old, overweight, birth weight 10 pounds 7 ounces; sister, seven weeks old, overweight, birth weight 10 pounds; mother 222 pounds, stocky, pituitary type; father 265 pounds; paternal aunt 200 pounds; paternal great-uncle 300 pounds.

Examination.—Pituitary type of obesity, penis small, buried in fat, testes descended, testes and scrotum normal size.

Treatment.—Antuitrin-S, 100 R. U., three times weekly for six months.

Results of Treatment.—At the end of six months, there was no change in genital development; he was having erections occasionally but no emissions.

CASE 4.—S. P., aged five and one-half years.

History.—Overweight, enuresis since infancy; birth weight 8 pounds; delivery normal; rapid increase in weight since measles at three years. Brother, twenty years old, weighs 200 pounds; mother, 180 pounds, pituitary type; father, 190 pounds.

Examination.—Pituitary type of obesity, genitals well developed.

Treatment.—Antuitrin-S, 100 R. U., three times weekly for six months.

Results of Treatment.—No change in genital development.

CASE 5.—L. S., aged nine years.

History.—Overweight, becoming more markedly so during past three years, doing poor work in school, lazy, and not concentrating well, actions slow; fainting spells associated with falling during early childhood, none for past four years. Birth weight 7½ pounds; early development slow, walked and talked late.

Examination.—Obese, pituitary distribution of fat, penis and scrotum underdeveloped, both testes undescended.

Treatment.—Antuitrin-S, 100 R. U., three times weekly for six months.

Results of Treatment.—At the end of six months, both testes were in scrotum but were underdeveloped; left one was pigeon-egg size, smaller than right; scrotum larger, no increase in size of penis; no erections or emissions.

CASE 6.—P. C., aged ten and one-half years.

History.—Overweight, sluggishness in action of six years' duration, retarded sexual development. Birth weight 7 pounds 15 ounces, early development normal; family history negative.

Examination.—Pituitary type of obesity, penis underdeveloped, testes in scrotum—smaller than normal, sparse pubic hair.

Treatment.—Antuitrin-S, 100 R. U., three times weekly for five months and then 150 R. U. three times weekly for one month.

Results of Treatment.—At the end of six months' treatment, there has been only slight increase in size of the penis; testes have become larger; pubic hair more abundant and axillary hair had begun to appear. He has become conscious of his genitals, frequently handling them. During the last three months he was having infrequent erections but no emissions.

CASE 7.—H. M., aged ten years.

History.—Undescended testes, overweight for past two years, constipated; making poor progress in school. Birth weight 9 pounds; early development normal. Mother short and stocky, pituitary type; father short and stocky; first child very large baby stillborn.

Examination.—Pituitary type of obesity, both testes undescended, penis and scrotum underdeveloped.

Treatment.—Antuitrin-S, 100 R. U., three times weekly for three months. Patient failed to return for further treatment.

Results of Treatment.—After four weeks, both testes could be palpated at internal rings; at six weeks both were in the scrotum and were underdeveloped; scrotum, larger. After three months the penis had not increased in size, and both testes had remained underdeveloped. No pubic hair, no erections or emissions.

CASE 8.—L. R., aged fifteen and one-half years.

History.—Underdeveloped genitals; effeminate, soft voice, rapid increase in weight during past two years. Birth weight 7½ pounds, delivery normal; early development normal. Mother obese, pituitary type; younger brother normal.

Examination.—Pituitary type of obesity; penis small, 2.2 cm. relaxed; testes underdeveloped; scrotum moderately relaxed; sparse pubic hair; no axillary hair.

Treatment.—Antuitrin-S, 100 R. U., three times weekly and desiccated anterior lobe pituitary gland 5 gr. t.i.d. orally for six months.

Results of Treatment.—After six weeks, penis and testes were larger; scrotum, more relaxed. After four months pubic hair was more abundant, axillary hair beginning to appear. After six months hair on upper lip was present; heavy growth of pubic hair, axillary hair more abundant, frequent erections. Nocturnal emissions first began ten days after treatment was discontinued. Penis larger, 6.7 cm. relaxed; testes and scrotum larger, voice masculine. Eight months after onset of treatment, nocturnal emissions occurred from two to three times weekly; penis, 7 cm.

SUMMARY

Descent of the testes was accomplished in all of the three cases (Cases 1, 5, and 7) of cryptorchism treated. In one instance (Case 1), both testes and scrotum showed considerable enlargement at the end of treatment. In three cases (Cases 2, 6, and 8) characterized by genital underdevelopment (testes descended), treatment resulted in enlargement of the testes and scrotum, the appearance of pubic hair, the occurrence of erections, and in the two older boys, twelve and fifteen and one-half years old (Cases 2 and 8), the occurrence of emissions. In two instances (Cases 2 and 8), the penis increased in size. In two cases (Cases 3 and 4), characterized by pituitary obesity with normal genitals, treatment resulted in no increase in size of the genitals.

Effect Upon Basal Metabolism (Table I)

Five patients received basal metabolism tests at the onset and at the termination of treatment (Table I). In four, the basal metabolic rates were below zero (-3.5, -11.7, -19.4, -8.8), two of which were below the lower limits of normal (-11.7, -19.4); one was +1.0. At the termination of treatment all were minus (-9.7, -11.8, -21.6, -17.0, -11.0), four of which were below the lower limits of normal. The case in which the reading was +1.0 at the onset of treatment had dropped

TABLE I

VARIATIONS IN WEIGHT, HEIGHT AND LABORATORY FINDINGS AFTER TREATMENT

NAME	AGE IN YEARS	WEIGHT IN POUNDS		HEIGHT IN INCHES		B. M. R.		BLOOD CHOLESTEROL (MG. PER 100 C.C.)		SUGAR TOLERANCE	
		BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER	BEFORE	AFTER
1. Arnold, W.	13	119	118½	58½	59½	−3.5	−9.7	205	195	95-96-80-103-88	92-125-131-108-99
2. Joseph, M.	12	146	144	64	67¼	+1.0	−11.8	179	192	80-118-98-125-92	85-82-96-98-73
3. William, T.	10	137	142½	56¾	58	−11.7	−21.6	208	208	92-115-105-97-95	96-108-105-92-90
4. Sherwin, P.	5½	74	81¾	46½	49	−19.4	−17.0	192	250	82-120-103-104-123	120-155-144-136-128
5. Louis, S.	9	77	77¾	50	50½	−8.8	−11.0	208	225	83-118-148-112-97	85-120-138-105-94
6. Phillip, C.	10½	131½	141½	62¾	64	+9.0					
7. Harold, M.	10	81½	78½	52	53⅛						
8. Lester, R.	15½	143	152½	66	68¼			153	135.5		

to -11.8 at the end of treatment. These figures indicate that in four cases (Cases 1, 2, 3 and 5) the prolonged administration of antuitrin-S lowered the basal metabolic rate below the lower limits of normal.

Effect Upon Blood Cholesterol

Blood cholesterol determinations were taken on six of the patients before and after treatment. In four (Cases 1, 3, 4 and 5, Table I), the initial cholesterol determinations were above the upper limits of nor-

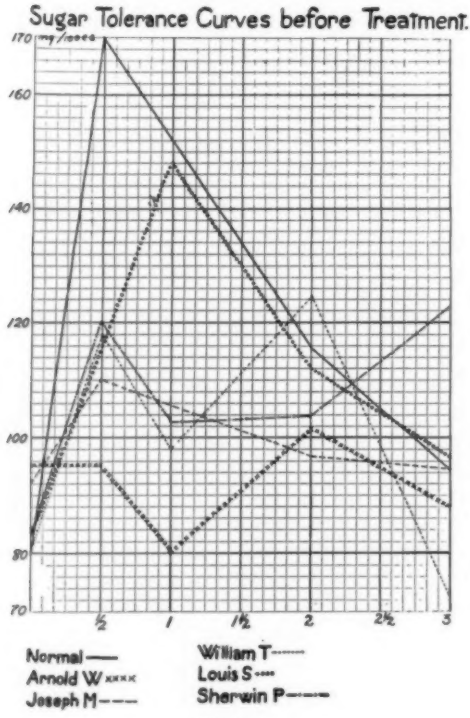

Chart 1.

mal.* In two (Cases 2 and 8), the determinations were within normal limits. Following treatment, three showed a slight increase (179—192, 192—250, and 208—225); and two showed a slight decrease (205—195, and 153—135.5). (In the latter, desiccated anterior lobe pituitary had been given by mouth in conjunction with the antuitrin-S hypodermically.) In one case, there was no change between the initial and final determinations. The inconsistency of the change in blood cholesterol level following therapy with antuitrin-S does not permit definite de-

*Normal limits of blood cholesterol from 150 to 190 mg. per 100 c.c. of blood.

ductions. We realize, however, that in a larger series of cases more information might be obtained.

Effect Upon Sugar Tolerance

In five cases, sugar tolerance determinations were made at the onset and at the termination of treatment. Chart 1 shows the curves of the individual cases before treatment. In four cases (Cases 1, 2, 3, and 4) the tolerance was increased as shown by the failure of the

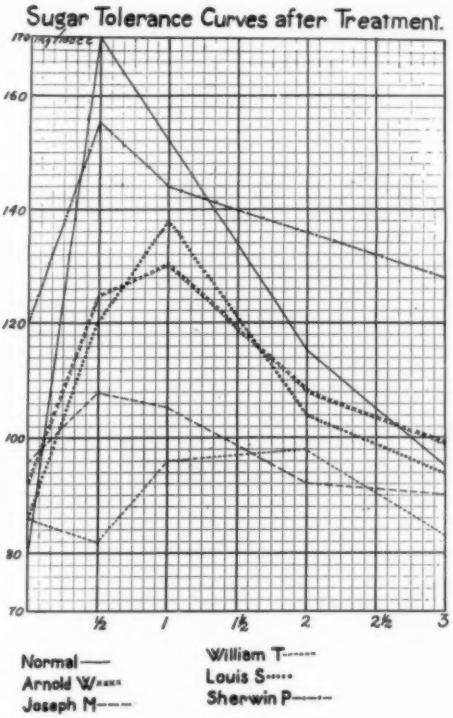

Chart 2.

curves to rise above 120 mg. per c.c. of blood in the first half hour and the maintenance of a low level during the three-hour period. In no instance was sugar detected in the urine during the three-hour period. The mean curve of the five cases is represented in Chart 3 and clearly shows the increased tolerance, the peak of the curve reaching only 113 mg. per 100 c.c. at the end of the one-half-hour period.

It is interesting to note a definite rise in two (Cases 1 and 4) of the curves following treatment (Chart 2). In three instances there was little change. The mean curve of the five cases (Chart 3) shows

a definite elevation with a maxium peak of 123 mg. per 100 c.c. at the end of one hour. Sugar was not present in the urine in any of the cases during the three-hour period.

It may be concluded that in our five cases there was a tendency for the sugar tolerance to decline under treatment with antuitrin-S.

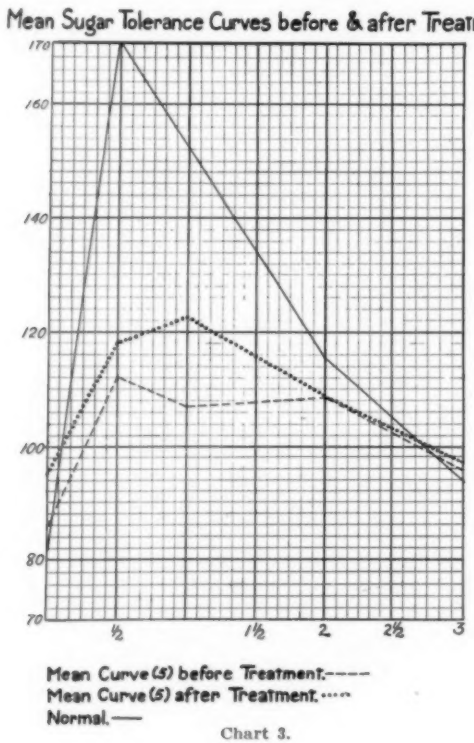

Chart 3.

Growth of Stature and Weight Variation

Following antuitrin-S therapy there was an increase in growth of stature above the normal for age in all but one case (Case 5, Table II). The increase in growth was decidedly marked in Cases 2, 4, 7, and 8, being 2.35, 2.9, 0.63 (treatment for three months), and 1.45 inches, respectively, above average increase for the period.

In three cases (Cases 1, 2, and 7) there was a loss of 1, 2, and 3 pounds coincident with an increase in height of 1, 3¼, and 1⅛ (three-month period) inches, respectively. In four cases (Cases 3, 4, 6, and 8) there was an increase in weight of 2, 5.6, 6.6, and 5.3 pounds, respectively, above the normal average for the age. Patient of Case 5

gained ¾ pound, 2¼ pounds below the average gain in weight for the six-month period.

In this small series of eight cases, it may be concluded that antuitrin-S has a stimulating effect upon growth of stature and that it

TABLE II

WEIGHT INCREASE AND GROWTH OF STATURE AFTER TREATMENT

NAME	AGE IN YEARS	DURATION OF TREATMENT	GROWTH IN INCHES	NORMAL INCREASE	WEIGHT CHANGE IN POUNDS	NORMAL INCREASE RELATIVE TO AGE AND HEIGHT
1. Arnold, W.	13	6 mo.	1	0.9	− 1	3.6
2. Joseph, M.	12	6 mo.	3½	0.9	− 2	3.3
3. William, T.	10	6 mo.	1½	1.0	+ 5½	3.5
4. Sherwin, P.	5½	6 mo.	4	1.1	+ 7¾	2.1
5. Louis, S.	9	6 mo.	½	1.0	+ ¾	3.0
6. Phillip, C.	10½	6 mo.	1½	1.0	+10¼	3.6
7. Harold, M.	10	3 mo.	1½	0.5	− 3	1.7
8. Lester, R.*	15½	6 mo.	2½	0.8	+ 9½	4.1

*Anterior lobe pituitary orally and antuitrin-S

does not stimulate weight loss. It also does not alter the typical pituitary distribution of fat as the pectoral and girdle obesity remained prominent in all cases after discontinuing treatment.

COMMENT

Since initiating our study in September, 1932, we have become interested in the reports of Schapiro, Goldman and Stern, and Brosius and Schaffer concerning the effect of extract of pregnancy urine upon male genital development.

Schapiro[30] reported observations on twenty-six male patients, from nine to twenty-nine years of age, receiving hypodermically an extract made from pregnancy urine. He states that the preparation contained the active factor related to the anterior pituitary lobe sex hormone, in a potency of 100 rat units per cubic centimeter. The diagnosis in a majority of the patients was "dystrophia adiposogenitalis." An additional four patients studied were two of infantilism, aged fourteen and eighteen years, and two cases of cryptorchidism, the patients being twelve and sixteen years old. The author divided all cases into four groups: (1) eunuchoid, (2) symptom complex—genital hypoplasia, adiposity, and decreased bodily function, (3) infantilism with retarded general development, and (4) cryptorchidism. In estimating the effect of the hormone, Schapiro divided the maturing effect on the genital apparatus into three phases: Grade 1 is related to growth of secondary sex characters or tendency of cryptorchid to downward displacement. Grade 2 includes enlargement of penis and testes with spermatogenesis. Grade 3 is regarded as complete sex maturity. In all cases Grade 1 was obtained by treatment. Fourteen patients were graded 2, and 9 graded

3. The best results were noticed in patients between the ages of fifteen and eighteen years of age. Treatment consisted of 100 R.U. of the extract given three or more times weekly over periods of three months with a one-month interval of nontreatment. Larger doses were used in several cases, but the author warns that function may be arrested by excessively large doses of the hormone, citing two instances of depressed spermatogenesis in middle-aged males following the administration of 1000 R.U. daily for ten days. He concludes that the hormone is most effective in immaturity.

Goldman and Stern,[31] in September, 1933, reported the results of treatment of two cases of cryptorchism using antuitrin-S and glandular extracts. The first was that of a twelve-year-old male, effeminate in appearance, phlegmatic, with scant pubic hair, small scrotum, small right testis, and undescended left testis. He received 100 R.U. of antuitrin-S three times weekly for nine months and 3 gr. anterior lobe pituitary, 1 gr. of whole pituitary, and 1/10 gr. of thyroid by mouth once daily. Under treatment, there was a slight loss of weight coincident with a growth of 1½ inches. There was a decrease in abdominal fat and a flattening of the hips. The pubic hair increased in amount, and the scrotum increased greatly in size. The right testis increased three times in size, and the left testis was palpated in the canal and was of good size. The general appearance had become more masculine.

The second patient was a boy, fifteen years old, who weighed 88 pounds and was 4 feet 9 inches tall. He was fair, blond, and slim. His voice was high pitched. The right testis was undescended; the left was in the scrotum, but of small size. There was no pubic hair, and the scrotum was small. Antuitrin-S, 100 R.U., was given three times a week. After one week of treatment the scrotum had increased in size, and both testes were palpated in the scrotal sac. The patient did not cooperate well. He did not receive the injections regularly, missing treatment for several weeks; nevertheless, he gained 4 pounds and grew 2½ inches. Both testes were in the scrotum, the left considerably enlarged, and there was a profuse growth of pubic hair. The voice had developed a lower pitch.

Brosius and Schaffer[23] report the case of an adult male, thirty-three years old, who developed complete aspermia and bilateral testicular atrophy following orchitis as a complication of mumps at the age of twenty-seven years. One-hundred R.U. of antuitrin-S was given twice a week. In two weeks the testes had increased in size and firmness, and a few nonmotile spermatozoa were found. At six weeks there were many nonmotile spermatozoa, and at nine weeks large numbers of actual motile spermatozoa were present. The testes had increased from 18 by 11 mm. to 20 by 28 mm. and the consistency returned to

normal. Treatment was discontinued after twelve weeks. Four weeks after withdrawal of treatment, aspermia returned.

An analysis of the results of Schapiro, Goldman and Stern, and our series of cases, makes us feel that the administration of extract of pregnancy urine is indicated in hypopituitarism of the male characterized by genital underdevelopment.

Evans, Simpson and Austin[33] and Collip, Selye, Anderson and Thomson[34] working with laboratory animals, have recently shown that the combined use of alkaline extract of the anterior lobe of the pituitary and prolan is more effective than either one alone, the former activating or enhancing prolan by its synergistic action.

SUMMARY

1. Eight male children with hypopituitarism were treated with extract of pregnancy urine (antuitrin-S).

2. Descent of the testes was accomplished in all of three cases of cryptorchism.

3. In three cases characterized by genital underdevelopment (testes descended), treatment resulted in enlargement of the testes and scrotum and the appearance of the secondary sex characteristics.

4. In two cases characterized by pituitary obesity with normal genital development, treatment resulted in no increase in size of the genitals.

5. In four of five cases receiving basal metabolism tests before and at the end of treatment, the basal metabolic rates were lowered below the lower limits of normal at the end of treatment.

6. The inconsistency of the change in blood cholesterol level following treatment does not permit definite conclusions.

7. In five cases receiving sugar tolerance determinations before and at the end of treatment, the tolerance was lowered at the end of treatment.

8. In seven of the eight cases, there was an increase in growth of stature above the normal for the age following treatment.

9. In our series of cases, antuitrin-S did not stimulate weight loss and did not alter the typical pituitary distribution of fat.

The authors wish to express their indebtedness to Miss Rita Nielsen, R.N., of the Pediatric Clinic for her assistance in this investigation.

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ACUTE HEMOLYTIC ANEMIA IN CHILDHOOD

With Unusual Cardiac Manifestation

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DURING the past nine years a number of cases of rapidly developing anemia of sudden onset and severe course have been reported, which cases respond dramatically to a transfusion of whole blood. The salient features of this illness are fever, marked pallor, jaundice, splenic and hepatic enlargement, erythroblastemia, leucocytosis, and hemoglobinuria. The most striking features are the suddenness of onset and the rapid and overwhelming blood destruction.

Previous to 1925 when Lederer[1] first called attention to this clinical entity, reference had been made by Osler[2] and Elsner[3] to acute forms of pernicious anemia. The latter mentions also an acute grave form of syphilitic anemia; neither author describes any specific cases. Macintosh and Cleland,[4] Brill,[5] Steffens,[6] Benhamou, Jude and Gill,[7] have reported cases of acute febrile anemia. Holst[8] and Christiansen[9] reported cases which are very similar, but both writers indicate that there was no relationship to pernicious anemia. Krumbhaar[10] has reported cases of patients with acute hemolytic anemia who have recovered after single transfusions. Lederer[11] in 1928 added three additional cases of acute hemolytic (infectious) anemia. Ottenberg[12] discussed acute febrile hemolytic anemia as an extraordinary specific disease. Lazarus[13] has reported two cases. Parsons[14] has described four cases, which Lederer pointed out in a subsequent report,[15] as cases of acute hemolytic anemia. Parsons and Hawksley[15] reported five additional cases. O'Donohughe and Witts[16] have collected thirty-six cases of patients, eleven of whom were between the ages of two and thirteen years. Some of these cases, however, may not belong in this group. Douglas[17] has added a typical case occurring in adolescence; his report makes no reference to similar instances in the literature.

Case Report.—S. A., male, aged eight and one-half years, was born in Palestine and had been a resident of Brooklyn, N. Y., for seven and one-half years. He was admitted to the pediatric service of Dr. M. B. Gordon of the Israel Zion Hospital on February 20, 1933, in the late afternoon.

His complaints were vomiting, headache, diarrhea, fever, and hematuria. The family history was negative. The past history revealed the removal of tonsils and adenoids at two years of age and a mild attack of measles in infancy; otherwise his health had been excellent. Two weeks before the present illness he had a

*From the Pediatric Service of Dr. Murray B. Gordon of the Israel Zion Hospital, Brooklyn, N. Y.
Read before the Brooklyn Pediatric Society, March 22, 1933.

"cold," from which he recovered in three days. He was well until the day before admission when he vomited and complained of headache. His temperature ranged from 101° to 103° F. The urine was bloody; the child's color became yellow and his stools, light colored.

The physical examination revealed a fairly well-developed and well-nourished male child desperately ill, comatose, markedly anemic, and jaundiced. The temperature was 105° F.; pulse varied between 160 and 154, and respirations were very rapid. There was no nuchal rigidity. The eyes reacted normally to light but not to accommodation; the sclerae were deeply jaundiced, and the eyegrounds were negative. The lungs were clear. Percussion revealed that the heart was moderately enlarged both to the right and left. The heart sounds were rapid, regular, and of fair muscular quality at the apical region. Over the aortic area and transmitted downward to the left of the sternum was heard a soft, blowing, high-pitched diastolic murmur. There was also heard a moderately long, rough systolic murmur over the apex and midprecordium. The blood pressure was 110/30. The pulse was of fair volume and of a Corrigan type. A pistol-shot sound was heard over the antecubital spaces and groins. The abdomen was not rigid or tender, and the liver was just palpable below the costal border. Neither the spleen nor any of the other viscera was palpable. The extremities were normal, and no abnormal neurologic signs were elicited.

The blood examination on admission showed: erythrocytes, 3,650,000 per c.mm.; hemoglobin, 75 per cent (Sahli); color index, 1.02; leucocytes, 16,500; polymorphonuclear neutrophiles, 68 per cent; lymphocytes, 30 per cent; monocytes, 2 per cent.

No urine specimen was obtained the night of admission.

Fluids were administered at once: 10 per cent dextrose solution in normal saline, 1,250 c.c. subcutaneously and 175 c.c. intravenously. A continuous intravenous drip was then attempted but had to be abandoned because of restlessness of the child.

Emesis occurred at intervals, and the child remained in a deep stupor most of the time.

The following morning the child showed no improvement. The jaundice was intense; he was restless at times, stuporous at other times with deep sighing respirations. He appeared to be exsanguinated. The lips were extremely pale and dry. Teeth and gums were stained with bile from the frequent vomiting. There was slight nuchal rigidity; the heart findings were as previously noted; and the examination otherwise was as on the previous day. The temperature was high, 104.5° F., and the pulse ranged about 160. The urine contained hemoglobin but no red cells. The blood count had taken a precipitous drop: erythrocytes, 600,000 per c.mm.; hemoglobin, 12 per cent. Because the child's condition was becoming rapidly worse and death was imminent, an immediate transfusion of whole blood, 200 c.c., was ordered; but enough blood was removed for all laboratory data before the transfusion was given. That afternoon another clysis of 500 c.c. of 5 per cent glucose in saline was given. The following day the boy showed marked—startling improvement. He was brighter, and there was absence of the previously noted prostration. The temperature was normal and continued so thereafter. Clyses were continued twice daily. The urine continued to be bloody but not as markedly so. The blood count improved: erythrocytes, 1,000,000 per c.mm.; hemoglobin, 15 per cent.

On observing the boy the following morning, the third day in the hospital, all of his symptoms had abated. He was bright, alert, and all vomiting had ceased. The jaundice was still marked; and the mucous membranes were pallid. There was a mass felt in the region of the spleen. Blood pressure was 92/35.

TABLE I

BLOOD PICTURE OF CASE

DATE 1933	HEMOGLOBIN PER CENT (SAHLI)	ERYTHROCYTES PER C.MM.	LEUCOCYTES PER C.MM.	NEUTROPHILES PER CENT	EOSINOPHILES PER CENT	MONONUCLEARS PER CENT	LYMPHOCYTES PER CENT	PLATELETS	BLEEDING TIME	COAGULATION TIME	STAINED PREPARATION
Feb. 20	75	3,650,000	16,500	48		2	30				
Feb. 21	12	600,000	14,000	72	1	25	2		3½ min.	30 sec.	Anisocytosis
*Feb. 23	15	1,000,000									Poikilocytosis
Feb. 24	22	1,150,000	12,200	79		5	16				Reticulocytes
Feb. 27	25	1,100,000	8,000	81	4	1	14				Marked Macrocytosis
Feb. 27	30	1,500,000	29,000	89		4	7	180,000	4 min.	3 min.	
Feb. 28	28	1,250,000	10,400	90	4		6				Less than above
March 1	35	1,550,000	11,900	78	6		16				
March 6	36	2,000,000	8,600	70	2	3	25				
†March 11	43	2,050,000									
March 15	54	2,500,000	9,000	57	2	1	40	200,000	3½ min.	2½ min.	Slight Anisocytosis
March 27	60	2,600,000	5,600	69	1	5	24				

*After transfusion.
†After second transfusion.

The heart sounds were normal, but the systolic murmur was heard at the apex, and the aortic diastolic murmur was less intense. The pistol shot sound in the groin persisted and there was slight evidence of the Corrigan pulse.

From then on convalescence was speedy with the exception of a mild attack of vomiting and transitory drowsiness on the fourth day. The heart murmurs persisted for a few days. The pulse pressure narrowed down to normal, and the pistol shot sounds disappeared. The jaundice gradually disappeared, as did the splenic enlargement. His pallor continued despite his feeling of well-being; he was given a second transfusion of 200 c.c. of whole blood on his eighteenth day in the hospital. He was discharged from the hospital as well thirty-seven days after admission, March 18, 1933.

LABORATORY DATA

Before Transfusion.—

1. Blood culture negative.
2. Fragility of unwashed red blood cells. Beginning at 0.325 and complete at 0.250.
3. Blood chemistry: glucose, 145 mg. per 100 c.c. of blood; urea N 67 mg.; creatinine, 4 mg.
4. Icterus index, 80.
5. Strongly positive indirect van den Bergh test.
6. Blood smear negative for malarial parasites.
7. Urine: 4 + albumin; 1 + acetone; negative for bile; 4 + benzidine test; granular débris in sediment.
8. Donath-Landsteiner test: negative on two occasions.
9. Blood Wassermann: negative on two occasions.
10. Rosenthal blood test for syphilis: negative on two occasions.
11. Examination of feces: negative for parasites and ova.
12. Urine: negative for leucin and tyrosin crystals.

After Transfusion.—

1. Icterus index: 4.8 (March 7, 1933).
2. Fragility of red blood cells: beginning at 0.350 and complete at 0.250 (March 7, 1933).
3. Evidences of hemoglobin were found in the first two specimens of urine following transfusion. Frequent subsequent examinations revealed no abnormal findings except albumin in faint traces.
4. Kidney concentration test was normal (March 7, 1933).

DISCUSSION

This case presents a picture almost identical to that described by Lederer[1]—the sudden onset, high temperature, extreme toxicity, marked anemia, jaundice, hemoglobinuria, and leucocytosis; all of which promptly and rapidly disappeared following a single transfusion. Frequent blood studies failed, however, to reveal erythrocytes of the blastic series, except on one occasion when a normoblast was found. Of interest also is the evidence of the high retention values of the metabolites studied before transfusion. Apparently the condition, as Lederer suggests, was one of mechanical retention due to obstruction of the glomerular capillaries of the kidney by the detritus from the enormous erythrocyte destruction. Subsequent studies of both the

urine and blood indicated a return to normal. The fragility test, contrary to other observations, in this instance resulted in an apparent increase of the resistance. However, one of us felt that all the less resistant erythrocytes were destroyed, leaving only young resistant cells. Although we felt that the one transfusion checked the disease, in order to hasten convalescence, the transfusion was repeated once.

The etiology is obscure. Though we attempted through all of our available laboratory facilities to arrive at some explanation, we as yet are ignorant of the cause of this illness.

Of particular interest, a finding that has not been reported in association with this condition specifically, is the aortic diastolic murmur with its concomitant signs. In many of the case reports mention is made of systolic murmurs, hemic in origin.

Goldstein and Boas[18] explain this phenomenon as due to a dilatation of the heart because of the deficient oxygen supply to the cardiac muscle and a subsequent stretching and relaxation of the aortic ring. Cabot and Locke[19] and Ortner[20] observed diastolic murmurs in severe secondary anemia and offered this same explanation. Sahli[21] many years ago suggested the alteration in the blood as the cause. Morse[22] more recently noted diastolic murmurs with Corrigan pulse and pistol shot sounds in the arteries of the groins in infants with marked anemias and observed their disappearance as the condition of the child improved. Our patient gradually became free of his murmurs as his anemia improved, and all the concomitant signs of aortic insufficiency, increased pulse pressure, Corrigan pulse, and pistol shot sounds in the groins gradually and permanently disappeared.

SUBSEQUENT FOLLOW-UP EXAMINATION

On January 8, 1934, approximately ten months after his discharge from the hospital, the boy appeared to be apparently normal except for a mild secondary anemia.

Blood study: Erythrocytes, 3,600,000;
Leucocytes, 6,000;
Hemoglobin, 70 per cent (Sahli);
Polymorphonuclear neutrophiles, 44 per cent;
Monocytes, 1 per cent;
Lymphocytes, 50 per cent;
Eosinophiles, 4 per cent;
Basophiles, 1 per cent;
Coagulation time, seven minutes;
Bleeding time, four and one-half minutes;
Fragility of red blood cells, beginning at 0.425 and complete at 0.275.

Blood Chemistry: (in mg. per 100 c.c. of blood).
Glucose, 122.7 mg.;
Urea, N 18.1 mg.;
Creatinine, 1.72 mg.;
Uric acid, 3.22 mg.

SUMMARY

A case of severe hemolytic anemia with icterus of the Lederer type is reported, characterized by the following:

1. Sudden onset with high fever, jaundice, leucocytosis, and severe anemia.
2. Evidence of rapid and enormous blood destruction.
3. Hemoglobinuria.
4. Mechanical interference of renal function.
5. The presence of apical systolic and aortic diastolic hemic murmurs added unusually interesting features to this case.
6. Prompt and permanent recovery following a single transfusion.
7. The causative agent is unknown.

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DERMOID CYST OF THE MIDBRAIN

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DERMOID cyst of the midbrain is rare in occurrence. To the best of our knowledge it has been reported but three times and never in the position and with the clinical symptoms which our patient presented. In England, Todesco[1] reported the case of a child who was born with a cyst on her external occipital protuberance. This grew larger and was removed, but a discharge continued from the wound. When she was less than two years of age, she developed symptoms of headache, vomiting, increasing mental dullness and stupor, later, convulsions, coma, and died. At autopsy a white cyst containing hair and pus about the size of a hen's egg was found in the right cerebellar hemisphere. Todesco also reported three or four similar cases which he had found in the literature. Heard and Abramson[2] reported an unusual case of a patient with a history of a wound in which a sharp instrument had penetrated the temporal fossa. A dermoid cyst was found here which had eroded into the middle cerebral fossa and into the retrobulbar space and had produced a unilateral exophthalmos. This tumor was successfully removed by surgical procedure. Shapiro[3] found at autopsy a dermoid cyst measuring 2.5 x 2.5 x 2 cm. in the subthalamic region of the midbrain replacing the infundibulum but not affecting the hypophysis. The patient was a thirty-six-year-old negress, who had had severe headaches over a period of two years, increasing polyuria, failing vision, increasing stupor and coma before she died. He summarized his study with the conclusions that tissues adjacent to the hypophysis have a predilection for inclusion tumors of all kinds, some of which contain fetal hairs, sweat glands and sebaceous glands and that these tumors are derived from embryonal rests of external ectoderm invaginated with Rathke's pouch.

D. P., a white male child, twelve years old, was admitted to the Columbus Children's Hospital, June 20, 1933, in coma. His present illness began two days before with precordial pain, increasing drowsiness the next day, and his lapsing into coma on the date of admission. His previous history was that of a normal child until he reached the age of three when he developed a convulsion. During the next six years he had no illness of any consequence. During this time there was an increasing unsteadiness of gait which forced him to leave school at the age of nine. Soon after that he lost control of both sphincters, and later on he experienced difficulty in moving his arms, especially his right arm. At the same time, he had had occasional severe headaches during which he would grab his head and hold it in his hands. Further than this his family had noted no evidence

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of any of the secondary male sex characteristics of puberty, but there was an increasing tendency to obesity. His past history other than given was negative. He had a sister who died at another hospital from a brain tumor.

Physical findings on admission showed a well-developed and nourished white male child in deep coma. He had a definite girdle of obesity; the breasts were prominent and large. The genital organs were underdeveloped for his age, and he had the long tapering fingers characteristic of hypopituitarism. His left pupil was larger than the right. There was a bilateral horizontal nystagmus and a questionable choking of the discs. His nose, ears, and mouth were negative. The heart and lungs presented no abnormalities. His blood pressure was 70/30. There was some spasticity of his extremities with deformity due to contracture. His genitals were of the infantile type. He had both a positive Oppenheim reflex and Babinski reflex and exaggerated knee and ankle jerks on both sides. Spinal puncture was made, and the fluid was obtained under increased pressure, but otherwise it was negative.

X-ray pictures of the skull showed that the cranium was slightly enlarged, and there was evidence of markings which would indicate an increase of intracranial pressure. The sella turcica was not clearly outlined, but was enlarged and showed evidence of erosion of the anterior process. These findings pointed to definite evidence of brain tumor, apparently in the region of the pituitary body or sella turcica. The neurologists who examined the patient stated that the adiposity together with the infantile genitals was suggestive of a pituitary tumor and that the increasing irregularity of gait and difficulty in walking suggested a cerebellar tumor. Ophthalmoscopic examinations revealed congested discs, which supported the probability of a tumor in the region of the sella turcica. At the time of admission the temperature was 104° F., and pulse, 110. Respirations were frequently of the Cheyne-Stokes type. His condition grew rapidly worse. Twenty-five per cent magnesium sulphate intramuscularly and spinal puncture failed to affect his intracranial pressure. His respirations grew more labored, his temperature higher and pulse imperceptible. He died the day after admission at 12:40 P.M. His temperature by that time had reached 109.8° F. rectally. The clinical diagnosis was left cerebellar tumor and a Fröhlich's syndrome due to a pituitary tumor.

Autopsy revealed the marked adiposity and feminine type of build and the small size of the genitals. There was a marked girdle of obesity. Peripancreatic fat and fat surrounding the urinary bladder in abundance was noted. The mesenteric lymph nodes were slightly enlarged and the mesentery was very thick, the result of its fat content. The rest of the body did not show anything remarkable until the head was opened. The following was the pathologist's report of his examination of the brain.

On stripping back the scalp, the head was found to be unusually large, showing rather marked bulging in both parietal regions. The scalp and external surface of the calvarium were otherwise normal. When the calvarium was removed, it was found to be extremely thin and to show some erosion of the bone in the parietal regions. In the parietal and temporal regions the bone was shaped to fit the convolutions of the brain. The cerebral hemispheres were large and bulging. The convolutions were flattened with a corresponding obliteration of the sulci. The pia arachnoid was transparent. The fluid beneath it was not increased. When the frontal lobes of the brain were elevated, a large cyst containing approximately two ounces of clear fluid, as well as some material resembling butter, was found at the base of the brain. The anterior wall of this cyst seemed to be formed by the pia arachnoid at the base of the brain and included the optic chiasma, which had been greatly stretched and showed almost

complete separation of the two sides. When the posterior lobes of the brain were raised in removal, the tentorium was found to be adherent to the posterior surface of the brain. When it was removed, there was adherent to it a large mass of sebaceous material containing hair. When the brain was removed and placed upon the table, it was so soft that the septum pellucidum split longitudinally, revealing a cyst filled with sebaceous material and hair which occupied, in addition to the midportion of the brain, parts of the thalamus and extended down into the interpeduncular fossa at the base of the brain. The ventricles were greatly distended with clear fluid thinning the cortex over the ventricles to 5 mm. The ventricles were filled with clear cerebrospinal fluid and had smooth walls. Sections into the cerebellum showed no pathologic change. The pituitary body had been pushed down against the base of the sella turcica by pressure of the cyst and was rather small and flat. Inspection of the orbital plates of the base of the skull showed them to be eroded. The remainder of the skull was normal.

SUMMARY

1. A case report is presented of a child who had both the symptoms of a brain tumor and of hypopituitarism. At autopsy a dermoid cyst of the midbrain was discovered, which cyst, besides causing marked increased intracranial pressure and internal hydrocephalus, produced a pressure atrophy of the pituitary body.

2. The case is reported because of its rarity and also because of the interesting symptoms of a Frölich's syndrome explained by the autopsy findings.

3. Recent literature is reviewed, and the conclusion is drawn that these dermoid cysts are inclusion tumors due either to ectodermal rests or trauma in which skin or hair is carried inside the body.

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STATUS THYMICOLYMPHATICUS

(With Reference to Asphyxia as the Cause of the Organic Findings and the Phenomenon of Sudden Death Occurring in This Condition)

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A CRITICAL review of the literature indicates that there is no accepted hypothesis which adequately accounts for status thymicolymphaticus and the sudden death which occurs in conjunction with this condition.

One fact that is well established regarding thymicolymphatic overgrowth is the importance of the thyroid gland. In 1924 D. Marine[16] discovered by experimental removal of the suprarenal cortex, that the presence of the thyroid gland is necessary in order to produce thymicolymphatic hyperplasia. Thyroid feeding leads to thymus hyperplasia, as has been shown by Hoskins[2] (1910), Utterstrom (1910), Courrier[3] (1921), and Klivanskaja-Kroll[5] (1929). Due to lack of data, the significance of thyroid stimulation was not clarified. Speidel[4] in 1926 described signs of red blood cell production in the venous sinuses of the frog's thymus upon thyroid feeding; this he explained by a greater need for oxygen due to the increased basal metabolism. The originator of the erythropoietic hypothesis of the thymus, Hewson,[1] in 1777, explained the persistence of the thymus until puberty by a greater need for oxygen during the period of development. Cannon[7] found that mechanical asphyxia stimulates the thyroid. Crile[12] recognized asphyxia as one of the causes which may stimulate the thyroid in Graves' disease. But the hypothesis has never been suggested that an asphyxial cause antecedent to the rise of basal metabolism must be the cause of status thymicolymphaticus; that the different causative factors which are known to stimulate the thyroid merge into one principle, that of primary asphyxia; furthermore that the rôle of the thyroid in status thymicolymphaticus is compensatory for the asphyxia and the continued increase of basal metabolism is the result of overcompensation.

By asphyxia is meant any insufficiency of tissue respiration. The several causes of asphyxia in thymicolymphatic states are listed in Table I, which gives a complete series of the thymicolymphatic states. Among the varied causes of asphyxia are: mechanical asphyxia (laryngospasm, compression of the trachea); decrease of the oxygen-carrying medium (hemolysis, hemorrhage); stimulation of

metabolism by emotion; physical exertion; toxic stimulation of the heat center; stimulation of katabolic processes due to lack of an anabolic hormone (suprarenal cortical insufficiency).

TABLE I

THE OCCURRENCES OF THYMICOLYMPHATIC HYPERPLASIAS AND THEIR SUPPOSED ASPHYXIAL CAUSES

OCCURRENCE OF HYPERPLASIA	THE CAUSE OF ASPHYXIA
1. Experimental status thymicolymphaticus produced by removal of suprarenal cortex (and the gonads) (Marine).	Removal of an anabolic hormone resulting in stimulation of katabolic processes.
2. Thymicolymphatic constitution (Paltauf). Familial group (Donaldson).	Chromaffin hypoplasia. In other cases congenital allergy. (See also groups 1 and 2.)
3. Thyroid feeding (Hoskins, Utterstrom, Courrier, Klivanskaja-Kroll).	Toxic overstimulation of metabolism. (This cause does not cover the cause of asphyxia in Graves' disease.)
4. Graves' disease.	The following conditions merge into one principle, that of asphyxia: emotion, pain, hemorrhage, infection, foreign protein, physical exertion, anesthesia, adrenalin injection, suprarenal-cortical insufficiency.
5. Acromegaly (Hammar, Marine).	Asphyxia is inferred from a stage of thyroid stimulation.
6. Myxedema (Hammar, Marine).	Similar to previous group.
7. Addison's disease (Marine).	A stage of suprarenal cortical insufficiency is supposed.
8. Epilepsy (Lenox, Cobb, Volland, Hammar).	Physical exertion, possible mechanical asphyxia.
9. Spasmophilia (Hammar).	Similar to previous group.
10. Febrile diseases (Hammar).	Probable toxic stimulation of heat center.
11. Allergy, foreign protein (MacDonald, Waldbott).	The katabolism of foreign substance increases the demand for oxygen.
12. Thymicolymphatic hyperplasia in soldiers (Gebele).	Continued emotional stimulation, excessive physical exertion.
13. Snake venom poisoning (Hammar).	Hemolysis, respiratory paresis.

The considerations upon which the above hypothesis is based, can be summed up as follows: In all cases of status lymphaticus there has been uncovered some form of asphyxia as the only condition which can account for the thyroid stimulation in the hyperplasias. Moreover, all causative factors which play a part in eliciting thyroid crises and Graves' disease, appear to be asphyxial in nature. This aspect of thyroid stimulation, its being secondary to asphyxia, suggests that thyroid stimulation in status lymphaticus is compensatory

for asphyxia. Compensatory hyperfunction of the organs concerned is dependent upon the rise of their metabolism, which is regulated by the thyroid gland. The increase of circulation and respiration, the increase of oxygen intake, are, in their turn, indications that the compensatory mechanism for asphyxia is hyperfunctioning. Unduly increased metabolism can be considered as overcompensation.

No hypothesis of status lymphaticus is adequate without an explanation of sudden death. Increased liberation of adrenalin, which also can be the consequence of asphyxia (Cannon), adequately explains sudden death. Such hyperadrenalism has been found in conjunction with sudden death and is further indicated by the hyperpyrexia of the body and by the presence of pulmonary edema. It is accepted, that ventricular fibrillation is among the mechanisms of sudden death, and that epinephrine plays a great part in the experimental production of this phenomenon.

A considerable amount of evidence can be adduced to support the above statements.

W. B. Cannon's[9] discovery, that asphyxia plays a causative rôle in stimulating the thyroid gland, is of great importance.

There is evidence to show how great a part physiologic asphyxia plays in the pathogenesis of Graves' disease, a syndrome showing status thymicolymphaticus in at least 60 per cent of the cases. Crile[12] states that thyroid crises in Graves' disease and Graves' syndrome itself may be due to (1) emotional excitement; (2) pain; (3) hemorrhage; (4) asphyxia; (5) infection; (6) foreign protein; (7) physical exertion; (8) anesthesia; (9) adrenalin injection.

One observes that each of these phenomena is related to a state of asphyxia. Emotional excitement and pain, which are characterized by reflexes of flight or defense; decrease of the oxygen-carrying medium by hemorrhage; physiologic stimulation of metabolism by physical exertion; and toxic stimulation of metabolism are all characterized by an increased demand for oxygen. The asphyxial nature of the above conditions is corroborated by the increased liberation of adrenalin, which has been described in most of them: increased secretion of adrenalin in mechanical asphyxia, pain and emotion (Cannon), in fever (Cannon), in anesthesia (Goldzieher[68]) in foreign protein invasion (Houssay and Molinelly[75]).

The investigation of Schmorl and Ingiers[11] corroborates still further how frequently the production of adrenalin is increased in diseases characterized by asphyxia. They examined 517 pairs of adrenal glands for adrenalin content from cases of diversified pathologic conditions.

The average adrenalin content of the suprarenals of healthy individuals is 4.59 milligrams. In Schmorl's series there were two cases of

sudden death showing status thymicolymphaticus. One had 8.75 mg. and the other 6.50 mg. of adrenalin in the suprarenals.

The average adrenalin content for cases of valvular heart disease was much higher than normal: this group showed an average of 6.54 milligrams of adrenalin. Sixty-one per cent of this group had higher values than the already high group average. Sixty to seventy per cent of the cases of lobar pneumonia and cases of adhesive pericarditis had higher values than the normal average. The adrenalin values in fever have never been found decreased. In no other type of disease was the adrenalin content found increased except in that characterized by asphyxia.

Besides Schmorl's communication we have been unable to find any data regarding the adrenalin content of the suprarenals in status thymicolymphaticus. There is valuable indirect evidence of increased adrenalin output in sudden death. We refer again to the hyperpyrexia of the body (Aschoff[63]). Waldbott[34] published the pathologic findings in over 30 cases of sudden death. In this series of cases pulmonary edema was a very frequent occurrence. It is a striking fact that adrenalin in sufficiently large doses causes pulmonary edema in the experimental animal (Auer and Gates[64]).

The evidence tends to indicate that there is increased adrenalin production in those cases of status thymicolymphaticus which have a sudden death. We believe that the significance of the increased adrenalin output within physiologic limits is compensatory and it is the result of physiologic asphyxia (Cannon).

Increased heat production, if it is continued indefinitely as is the case in experimental status lymphaticus and in Graves' disease, can be interpreted as the result of overcompensation of the thyroid and adrenals. This may occur through hypersensitization of the metabolic centers. Thus a secondary asphyxia will arise with further effort at compensation by the thyroid and adrenals. A vicious circle will originate and continue until the organs of tissue respiration are exhausted, or successful therapy interrupts it. The signs of sensitization in Graves' disease are numerous, such as a lowered threshold to x-ray erythema, hypersensitivity to adrenalin and iodides, dermographia, in fact activation of every organ (Crile).

The phenomenon of sensitization of the cell by adrenalin was demonstrated by Cannon in the physiology of the muscle. The same author states that adrenalin sensitizes every tissue.

Consistent with the asphyxia hypothesis of thymicolymphatic hyperplasias are the following syndromes which in their turn substantiate the formulation of our major concept:

1. *Experimental thymicolymphatic hyperplasia.* Marine[16] and his coworkers in 1924 produced experimental status thymicolymphaticus

by removal of the suprarenal cortex. Lymphocytosis was also observed. While enlargement of the thymus alone, or together with the lymphatic tissue, following suprarenalectomy was seen by some previous experimenters, Marine discovered that the per kilogram of body weight heat production increased and continued indefinitely. Marine also observed that the hyperplasias did not develop if the thyroid was removed together with the suprarenal cortex. Castration resulted in similar hyperplasias but of lesser degree.

More recently some discoveries have been published regarding the physiology of suprarenal cortex, which enable us to interpret suprarenal cortical insufficiency in the light of the asphyxia hypothesis. Medvedeva[21] in 1932 isolated an insulin-like substance from the suprarenal cortex, which is active in high dilutions and is evidently a hormone. This remarkable substance causes hypoglycemia and marked glycogen synthesis in the liver. The hypoglycemia reaches its peak in about 4 hours. On the culmination of the hypoglycemic reaction the oxygen consumption sinks to about 33 per cent of its normal value. Medvedeva's hormone, therefore, is anabolic. In the absence of its action the excess of sugar will constitute a stimulus for katabolic processes and thus give rise to asphyxia. The correctness of this interpretation is borne out by the beneficial effect of feeding fresh suprarenal gland in Graves' disease (Marine).

We have been fortunate in finding in the literature a clinical and pathologic counterpart supporting Medvedeva's discovery. Anderson[20] reported the case of a white male, thirty-three years of age, who was admitted to the hospital in a semiconscious state. This patient had 60 mg. of sugar per 100 c.c. of blood and improved on glucose treatment. After a recurrence the patient died. The autopsy revealed an encapsulated tumor of the left suprarenal, which was cortical in origin. Anderson remarks that this is the first reported case of suprarenal tumor with hypoglycemia.

2. *Thymicolymphatic hyperplasia in Addison's disease.* Hammar[47] reports the occurrence of thymicolymphatic overgrowth in this syndrome. In some stage of this disease suprarenal cortical insufficiency must be present (Marine[19]).

3. *Status thymicolymphaticus in Graves' disease.* Thymus hyperplasia is present in over 60 per cent of the cases. Thymuses weighing as much as 6 ounces are described in this condition. It is an example of how the different etiologic factors merge into one principle, that of primary asphyxia. The increased metabolism constitutes the cause of a secondary asphyxia.

4. *Thymus hyperplasia in acromegaly.* This group is mentioned by Hammar, Marine, and others. It appears possible to consider this

group also as the result of thyroid stimulation: acromegalic features may be observed in Graves' disease; acromegaly is frequently arrested by irradiation of the thyroid.

5. *Thymicolymphatic hyperplasia in myxedema.* A stage of thyroid stimulation must be admitted before exhaustion of the thyroid. Myxedematous features may be observed in Graves' disease.

6. *Thymus hyperplasia in epilepsy and spasmophilia.* Hammar reported such cases in his collection of over one thousand thymuses.[47] Thymus hyperplasia in epilepsy was also reported by Volland.[24] In a series of 102 cases of epilepsy 24 presented a hyperplastic thymus. Considering the rapid involution of the thymus in disease, Volland's figures are quite high.

According to Talbot[31] and Hess[53] it is safe to conclude that there is no increased basal metabolism in spasmophilia. Lenox and Wright[25] studied the basal metabolism in 302 epileptics and the average was found to be minus 3. The intermittent character of the asphyxia and its possible lesser degree may account for the balanced compensation of the thyroid adrenal system.

7. *Thymus hyperplasia in snake venom poisoning.* This type is described by Hammar.[45] The asphyxia may be due to hemolysis and respiratory paresis. There is no fever in snake venom poisoning as a study of Calmette's work demonstrates,[26] and there is no available evidence in the literature to show that the metabolism rises.

8. *Thymus hyperplasia in febrile diseases.* Bacterial toxins stimulate the heat center and the increased heat production may be considered as the source of primary asphyxia (Hammar[47]). Increased liberation of adrenalin is present in fever.

9. *Thymicolymphatic hyperplasia in allergy.* MacDonald[27] reported autopsy findings in 8 cases of asthma. In this group 5 cases showed thymus hyperplasia and 6 of the cases presented general lymphatic hyperplasia. Waldbott[34] reports lymphoid hyperplasia in 8 cases of anaphylactic shock in a group of 15 cases.

The thyroid link in allergy is established: one can observe increased basal metabolism in allergy as it was shown by Bungeler.[28] Santenoise[29] demonstrated, that peptone shock could not be readily produced if the nerves of the thyroid have been severed. Peptone shock is a partial phenomenon of anaphylactic shock (Besredka[30]).

The common postmortem findings in status lymphaticus, sudden death and anaphylactic shock, have been emphasized by Waldbott[34] as an evidence of the constitutional nature of allergic conditions. We utilize Waldbott's data on pulmonary edema in allergy and status lymphaticus as a possible indication of increased adrenalin production, which in its turn again points to an asphyxial cause.

10. *Status thymicolymphaticus in soldiers.* Gebele[55] states that from 50 to 85 per cent of young soldiers had status thymicolymphaticus during the World War. It is possible that continual emotional stimulation will explain this occurrence. We frequently observe the increase of basal metabolism in our clinical tests upon excitement of the patient. Experimentally the thyroid is stimulated by emotion (Cannon).

11. *Thymicolymphatic constitution of Paltauf.* Although the asphyxial states underlying thymicolymphatic overgrowth can be acquired in later life, there is a constitutional form described by A. Paltauf[74] in 1889. We enumerated the acquired forms at the onset for a didactic reason. The asphyxial cause or its equivalent, the thyroid stimulation, can be more easily pointed out in the groups of acquired status thymicolymphaticus. Paltauf's discovery of status thymicolymphaticus was the result of observation of minute facts which seemed to recur. Paltauf described the lymphatic habitus: fair amount of fat, pallor, scanty body hair. The constitutional anomaly could result in the failure of the nervous centers of the heart, centers situated in the brain. This was a remarkable intuition, which materialized forty years later by the discovery of fibrillation reflex centers in the brain. Clear distinction should be made between Paltauf's theory of constitutional defectiveness of nervous units in the brain, and other theories which tried to explain sudden death by overstimulation of the vagi by hormones or toxins originating from the thymus.

Wiesel[70] in 1904 made a further contribution to the essential discovery of Paltauf. Wiesel described his observation that hypoplasia of the chromaffin system, especially of the suprarenals, is associated with thymicolymphatic states. Resulting from this decrease of chromaffin tissue, Wiesel assumed a decrease of adrenalin secretion and advocated the supremacy of the vagi in status thymicolymphaticus. Wiesel's monograph on the thymus gland appeared in 1911. In this work sudden death was interpreted as the consequence of thymogenous vagotony.

We shall recall that chromaffin hypoplasia is a competent cause of asphyxia leading to status lymphaticus, although the constitutional (congenital) type of status lymphaticus may not always be due to chromaffin hypoplasia. Von Sury, quoted by Gebele[55] and Zondek,[57] could not confirm the coexistence of chromaffin hypoplasia with status lymphaticus in all of their cases. Status lymphaticus of the constitutional type may also be the result of congenital allergy (Waldbott[34]) or of hypoplasia of the gonads (Zondek[57]).

Marine states that status thymicolymphaticus may be congenital and acquired. A study of Table I convinces us that this is true. The constitutional nature of status thymicolymphaticus was studied by

Donaldson[51] who showed by roentgenograms of a large number of children, that thymus hyperplasia appears to occur to family groups.

The doctrine of vagotony is criticized by Cannon,[10] who considers it absurd to have hormone control for qualitative parasympathetic functions, which would result in simultaneous actions of an undesired nature. Cannon holds that organ control is largely achieved by innervation, while adrenalin has a quantitative influence upon both the sympathetic and craniosacral autonomic systems.

Among others Hartman[59] demonstrated the great influence of adrenalin upon the craniosacral autonomic vasodilators. Hess[62] described dilatation of isolated capillaries by adrenalin.

Such clinicians as von Bergman[60] and Goldstein[54] found the classification of patients into a sympathicotonic and a vagotonic group impracticable.

The knowledge of status lymphaticus was widened by the discovery of Marine that thyroid stimulation is indispensable in the pathogenesis of status thymicolymphaticus.

The series of thymicolymphatic hyperplasias is thus completed.

The validity of the asphyxia hypothesis of status thymicolymphaticus must receive its final test by its application to the accepted mechanism and pathologic findings of sudden death, and we believe this requirement can be admirably satisfied.

The tangible pathology in status thymicolymphaticus consists of overgrowth of the thymus gland and lymphatic tissue, pulmonary edema, dilatation of the pulmonary capillaries, petechiae on the serous surfaces, and compression atrophy of the trachea in some cases. Compression of the trachea in vivo was observed in 300 cases of thymic overgrowth in children. Compression of the trachea in adults does not seem to play an important part. Obstruction is also possible through pressure paralysis of the inferior laryngeal nerves, which results invariably in death (Ch. Jackson, Pancoast[48]). The rise of the apex of a hyperplastic thymus and bulging in the jugular notch was described by Rehn[15] in 1906. Intermittent compression is bound to add to the existing degree of asphyxia, which in its turn may cause further hyperplasia. A vicious circle develops, which may result in sudden death by a critical rise of asphyxia, hyperadrenalism and ventricular fibrillation.

Ventricular fibrillation as a mechanism of sudden death is accepted by Aschoff.[63] Paltauf came to the conclusion that failure of the nervous centers of the heart in the brain causes death in these cases. Pott[49] and his assistants witnessed 8 sudden deaths of children. Pott describes the attack: "The child becomes deeply cyanosed, the glottis is closed, the extremities are in rigid extention, the head is thrown back,

the spine in opisthotonus." When this deeply livid child is seen, the drama is ended, however; the heart stopped at the onset of the attack.

In Post's autopsy records pulmonary edema was not mentioned.

From these three observations it appears that the extent of pulmonary edema is very often not sufficient to cause death, but that a mechanism which leaves no pathologic evidence; namely, ventricular fibrillation, is more than likely the cause. Increased liberation of adrenalin, which was found to be the consequence of asphyxial states, may have a paramount importance in the causation of ventricular fibrillation and would explain the pulmonary edema, when this is present.

The experimental data on ventricular fibrillation and on innervation of the heart point to the sympathetic system and increased adrenalin liberation as the agency by which this mechanism of death can originate.

Anatomic investigations show that the preponderance of the sympathetic fibers to the heart end in the left ventricle.

Rothberger and Winterberg[66, 67] found that upon stimulation of the left accelerans, or left ganglion stellatum, ventricular fibrillation ensued in 30 per cent of the experiments. They were able to demonstrate that in the presence of a minute amount of barium or calcium, an infinitesimal amount of adrenalin (0.00001 gr.) caused ventricular fibrillation.

Brown and Samet[69] further developed this chapter of physiology, showing the influence of the central nervous system upon ventricular fibrillation. This is consistent with the occurrence of sudden death upon central nervous impulses. The discovery of a fibrillation reflex center in the brain by Brown and Samet[69] recalls the contention of Paltauf, that the overtaxation of the nervous centers governing the heart was the cause of death in these cases.

* * *

The physiology of the thymus was reviewed by Marine[18] in 1932, who came to the conclusion that the thymus, originating close to the parathyroid, may have something to do with calcium metabolism. Solis' and Riddle's[32] experimental investigations on the relation of the thymus to calcium metabolism are quoted by Marine.

In 1919 Park and McClure[41] completed an experimental and critical review of the thymus problem by extirpation of the organ in a large number of dogs. They reached the conclusion that the thymus was without influence upon the bony development and rickets.

The results of irradiation of the thymus are in harmony with the results of extirpation (Hess, G. H.,[10] Barnes[72]). Unfavorable reports upon thymus irradiation by Bircher[61] came from goiter regions and should be critically considered.

The relation of the thymus to the thyroid was studied by means of intraperitoneal transplantations and led to the erroneous claim of Capelle and Bayer,[43] and Bircher,[58] that the thymus played a part in the pathogenesis of Graves' disease. The labyrinth of errors is well illustrated by the work of those who claimed to have found thyroid hyperplasia on extirpation of the thymus (Klose-Vogt,[40] Matti,[50] MacLennan[33]). This conflict is thoroughly discussed by Park and McClure, who state that "the thyroid preeminently exhibits marked unaccountable variations from the normal type and also responds with well-marked structural alterations to a variety of environmental influences, some of which appear to be exceedingly mild."

Hunger being one of the causes resulting in an atrophic thyroid, we feel that the well-known hunger involution of the thymus may find its cause in the hunger atrophy of the thyroid.

The theory of nuclein-synthesis in the thymus occupied an important place in the literature and is connected with the names of Dustin[38] and Liesegang.[39] This theory is based on the ectodermal origin of the small thymus cell. The histogenesis of the small thymus cell was reviewed by Ruth Deanesly[35] in 1929. This author pointed out the chemical and staining peculiarities of the small thymus cell and claimed that both thymus medulla and cortex are of ectodermal origin. Hammar,[47] Maximow,[36] and Popoff[37] represent the mesodermal theory of origin of the thymus lymphocyte. The mesodermal theory of the small thymic cell and its erythropoietic function is championed by Speidel,[4] and negated by Marine.[18]

The problematical rôle of the thymus as a growth-promoting organ was experimentally reviewed by Uhlenhut[44] in 1919. The investigation led to the conclusion that the thymus does not promote growth. Hammar[48] also does not believe that such a function of the thymus is proved although it is not excluded by this authority.

Hammar, the most prominent investigator of thymus pathology and physiology, advanced the hypothesis of detoxification by the thymus, the thymus having an immunologic function. In recent years thymicolymphatic hyperplasias have been reported in a number of conditions which have no connection with immunity.

We feel that the thymus is a regressive organ, the function of which is obliterated. Thymus hyperplasia is always preceded by asphyxia, and it is dependent on thyroid stimulation. These two facts may indicate that the thymus has been an organ of tissue respiration.

SUMMARY

A review of the literature indicates that asphyxia in status thymicolymphaticus is not symptomatic, but causative. The hypothesis is advanced that the rôle of the thyroid in status thymicolymphaticus is compensatory to a primary asphyxial cause. The different causative factors which are known to stimulate the thyroid all merge into one principle, that of primary asphyxia, which is antecedent to the rise of basal metabolism. This statement, that the stimulation of the thyroid is compensatory for asphyxia, can be made because some form of asphyxia was uncovered in all thymicolymphatic states as the only common characteristic which can account for the thyroid stimulation, essential for all these conditions and because thyroid stimulation is always secondary to asphyxia. Continued increase of basal metabolism is considered as the result of overcompensation.

The generalization that asphyxia is the only cause of thyroid stimulation, is contrasted with the opinion that has been expressed that asphyxia is one of the causes of thyroid stimulation in thyroid crises and Graves' disease. This generalization became possible through the recognition that increase of adrenalin liberation was reported in all conditions which are stated to produce thyroid crises and Graves' disease. Increased liberation of adrenalin was taken as an indicator of a state of asphyxia. In Schmorl's statistics, extending to 517 cases of varied pathologic conditions, increased production of adrenalin was found only in those characterized by asphyxia. Increased liberation of adrenalin and asphyxia appear to denote the same thing in medicine. Cannon's discovery, that asphyxia stimulates the adrenalin output, appears to have a universal significance.

The asphyxia hypothesis was applied to all clinical syndromes of status thymicolymphaticus, and to the experimental production of thymicolymphatic overgrowth by removal of the suprarenal cortex, which appears to be one of the numerous ways by which asphyxia can originate.

The validity of the asphyxia hypothesis was further tested by its application to the sudden death problem. This basic requirement could also be satisfied. The pathologic findings in sudden death in status lymphaticus are seldom sufficient to explain death. A mechanism of death which does not leave sufficient trace, namely, ventricular fibrillation, is considered the cause by Aschoff. This mechanism is consistent with the increased liberation of adrenalin in asphyxial states. Increased adrenalin content of the suprarenals was found in two cases of sudden death by Schmorl. We can infer the increased adrenalin effect in sudden death further from the hyperpyrexia of the body described by Aschoff and from the more or less marked pulmonary edema.

Thus we have an all-including hypothesis of status thymicolymphaticus, which has no exceptions and offers a satisfactory explanation as to the rôle of the thyroid gland in these conditions. It also explains satisfactorily the original problem of sudden death. The search for a solution for this enigmatic phenomenon led Paltauf to the discovery of status lymphaticus.

TABLE II

THE CAUSATIVE RÔLE OF ASPHYXIA AND THE SIGNIFICANCE OF THYROID STIMULATION IN THYMUS PHYSIOLOGY, IN THE PATHOGENESIS OF STATUS THYMICOLYMHATICUS AND GRAVES' DISEASE, AS FOUND IN THE LITERATURE

AUTHOR	CAUSE OF ASPHYXIA	RÔLE OF THE THYROID
Hewson[1]	Growth of the organism. (More oxygen is needed, more red cells are produced by the thymus.)	----------
Speidel[4]	Increased basal metabolism. (More oxygen is needed, more red cells are produced by the thymus.)	Causation of asphyxia.
Crile[12]	Asphyxia is one of the causes of thyroid crises and Graves' disease.	Causation of hyperkineticism.
This reviewer	All causes of thyroid stimulation merge into asphyxia, which is antecedent to the rise of basal metabolism.	Compensatory for asphyxia. Unduly increased basal metabolism is overcompensation.

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Pediatric Clinics

THE DEPARTMENT OF PEDIATRICS, JOHNS HOPKINS UNIVERSITY

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THE department of pediatrics at Johns Hopkins is housed in the Harriet Lane Home for Invalid Children, which is an integral part of the Johns Hopkins Hospital. It provides in-patient and out-patient facilities for sick children, teaching facilities for medical students, and laboratories for the members of the departmental staff.

HISTORICAL

Prior to 1909 the pediatric department was in charge of Dr. William D. Booker. It was a subdivision of the department of medicine and functioned in two small rooms. It was solely an out-patient department having no beds of its own although a few children were admitted to the adult wards.

In 1909 Dr. Clemens von Pirquet was called to the chair of pediatrics, and the department became a separate unit. It still lacked beds, however, and only the out-patient department provided material for clinical work, teaching, and study. Dr. von Pirquet drew up the plans for the present building, but before it was completed, he relinquished his post and returned to Europe.

In 1912 the Harriet Lane Home was opened, and Dr. John Howland became professor of pediatrics. The present development of the department dates from that time. Dr. Howland had studied in the clinic of Czerny at Strasbourg, and was deeply imbued with the idea of a "university clinic" in which clinical study, teaching, and the laboratory investigation of disease were carried on under the same roof under the aegis of the university. He may be said to have founded the first pediatric clinic of this kind in the United States. The "full-time" plan, which was adopted in 1914, undoubtedly contributed to the fulfillment of this idea.

Since 1927, a year after Dr. Howland's death, the department has been in charge of Dr. Edwards A. Park. In the twenty-two years that have elapsed since it began to function as a complete unit, there has been a steady growth in the amount of clinical material and a corresponding increase in the size of the staff. There have been various changes in the plant itself and in the organization. However, only the department as it exists today will be described here.

PLANT

The building and equipment of the Harriet Lane Home have been described in detail in an article by Dr. Weech.[3] At the present time an average of seventy patients, both white and colored, are treated in the wards, and there are also twelve rooms available for private patients. Children are admitted up to the age of fourteen years, but approximately one-half of these are under two years of age. Most of them are medical cases, only a small proportion being surgical. Adjoining the

Associate Professor of Pediatrics, Johns Hopkins University.

Harriet Lane building proper are three special pavilions designed for the care of patients with contagious diseases. Because of inadequate funds these buildings have never been operated at capacity for that purpose. They have been used as wards only in times of special epidemics, patients with contagious disease being ordinarily referred to the city hospital.

The out-patient department handles an average of one hundred patients daily; these are seen almost entirely by appointment. A social history is taken by the admitting clerk on all new patients. The dispensary is manned very largely by the interne staff, although medical students, a few local practicing physicians, and occasional postgraduate students also work there. The physician in charge of the dispensary is a member of the department staff who devotes his entire time to that task. He reads all the histories each day, personally supervises a large part of the clinical work, and directs the activities of the social service in regard to dispensary patients.

In recent years a number of special clinics have been developed in the dispensary for purposes of special study or special treatment. Those in operation at present include clinics for infantile tuberculosis, congenital syphilis, epilepsy, heart disease, and the behavior problems of childhood. Smaller clinics for diabetes, allergic diseases, rickets and bone deformities, organic nervous diseases, and dental problems are also organized. A clinic for examination of children brought in by various social agencies, prior to placement in homes or institutions, is also in operation. Other special clinics have been called into being from time to time, as one or another problem was under investigation. The dispensary is so organized that students, internes, and others who work in the general dispensary can have access to the patients in the special clinics as well.

SOCIAL SERVICE

The social service of the pediatrics department has been extensively developed during the past fifteen years. Its staff consists of a head worker and nine full-time social workers; in addition to these, there are five or six part-time volunteers. Some of the workers are attached to special clinics such as the syphilis, tuberculosis, cardiac, the behavior and the epileptic clinic, while others handle the general cases from the dispensary and wards. The community served by the hospital contains a large colored population, and social problems are almost omnipresent. During the past year more than one thousand individual patients were referred to the social service department. More than five thousand home visits were made by workers during the year.

The social service gives invaluable assistance to the medical staff in the treatment of patients and in the study of disease. It supervises home treatment, a service for which the need has been particularly acute lately because of limitation of hospital beds. It obtains information in regard to the home environment which is often of great value in guiding the medical staff in regard to admissions and discharges from the wards. It provides a follow-up service for ward and dispensary patients. It is constantly in touch with other institutions and various charitable and social agencies throughout the city and state. Through it arrangements are made for transfer and placement of patients, and for financial or other relief when needed. The social service is a valuable asset in collecting patients for teaching purposes, and lastly it performs an essential function in the clinical research studies which are in progress by collecting information on the home environment, supervising home treatment, and ensuring return visits to the hospital.

A very close relationship is maintained between the medical and the social service activities. Representatives of the social service make ward rounds with the house staff, and the social service record is incorporated in the medical history.

AFFILIATIONS OF THE DEPARTMENT

The pediatrics department is a unit in a compact medical center which includes the Johns Hopkins Hospital, the School of Medicine, and the School of Hygiene and Public Health of Johns Hopkins University. Embryologic laboratories of the Carnegie Institute of Washington are also housed in the medical school buildings. This proximity makes for close cooperation between the different departments, both as regards consultations and treatment.

The Harriet Lane Home for Invalid Children.

An arrangement is in force whereby babies born on the obstetric service are routinely examined by a member of the pediatric staff, who also serves as a consultant when special pediatric problems arise on that service.

A well-baby clinic is not operated by the pediatric department, but close relations are maintained between the Harriet Lane Dispensary and a series of Welfare Centers scattered over the city operated by the Babies' Milk Fund Association and the City Department of Health. Sick infants are referred from these Welfare Centers to the Harriet Lane Home, and patients who have recovered from an illness are referred to the neighborhood welfare clinic.

A close contact is maintained with the municipal hospital for contagious diseases. This is used as a teaching hospital for students in the Johns Hopkins Medical School. Each interne on the pediatric service spends six weeks of his time at this hospital.

There are two convalescent homes, situated in the suburbs of Baltimore, with which the pediatric department is intimately connected, and to which many ward patients are discharged for convalescent care. The St. Gabriel's Home for Con-

valescent Girls is given medical service by members of the department of pediatrics. The Happy Hills Convalescent Home for Children, which cares for both boys and girls, is provided with a medical visiting staff who are either past or present members of the pediatric staff.

PERSONNEL

The resident house staff consists of ten members: a resident, two assistant residents and seven house officers. The latter are appointed for one year only; the resident and assistant residents often retain office for a longer period. The house officers, in addition to the care of their ward patients, work regularly in the outpatient department.

The members of the departmental staff who do not live in the hospital number an additional twenty-two persons: the professor of pediatrics, two associate professors, three associates, eleven instructors, and five assistants. Thirteen of these: the professor and associate professors, two associates, seven instructors, and one assistant are on the full-time plan, the remainder being practicing physicians who devote a certain amount of time to the institution.

With the exception of two individuals who are working on fellowships in the laboratories, all the members of the departmental staff perform clinical duties either on the wards, in the general dispensary, or in the special clinics. Most of them also devote part of their time to laboratory work.

LABORATORIES

The department is equipped with clinical laboratories, a bacteriological laboratory, chemical and biological laboratories. Pathological examinations are made in the general pathological department, there being no segregation of the pediatric material. The clinical and bacteriological laboratories exist at present only for routine work. Some routine determinations are made in the chemical laboratory. On the whole, however, the chemical and biological laboratories, which comprise the entire top floor of the building, exist for research purposes.

RESEARCH

The problems being studied today are naturally no guide as to those that may be under investigation a few months hence. But, since they illustrate the type of work that is likely to be in progress, it may be of interest to enumerate them.

In the chemical laboratory the problems under investigation include a study of the metabolism of iron, copper, and of blood pigments in anemic states and infections; a study of the magnesium metabolism with particular reference to the decalcifying properties of this element and its relation to the parathyroid hormone; a comparative study of fats from the point of view of absorption; the parenteral administration of fat; studies of the water balance in epilepsy and in states of dehydration. In conjunction with the department of psychiatry, a study is being made of the carbohydrate metabolism in various psychiatric conditions.

Work in progress in the biological laboratory includes: an anatomical study of the conduction system of the auricle; the experimental production of lead poisoning and comparisons of various forms of treatment; the occurrence of lead in human blood; a study of the anatomical basis for x-ray changes in the bones in various pathological conditions; a study of the biological properties of strontium; studies of the etiology of pathological calcification, with particular reference to the influence of viosterol and the parathyroid hormone.

A number of purely clinical studies are in progress. Many of these are minor problems brought up by individual patients. More comprehensive studies are also

under way, particularly in connection with the special clinics. Most of the special clinics include among their functions the collection of statistical data with a view to the more accurate description of disease or the testing of some therapeutic measure. For example, in the tuberculosis clinic a series of infants, infected or exposed under two years of age, is being followed with the greatest care for a fifteen-year period. The chief points under investigation are the source of infection, the course and prognosis of infantile tuberculosis, the transition from the infantile to the adult form of the disease. A controlled series of children who cannot be removed from tuberculous environments is being studied to ascertain the protective effect of inoculation with dead tubercle bacilli. In the rickets clinic a prophylactic and therapeutic study of the effective dosage of various antirachitic agents is being carried out in infants and in children with late rickets.

The diversity of the studies in progress bears witness to the policy which has been followed by the head of the department of allowing the various members as much freedom as possible in the selection of their problems for investigation.

TEACHING

Undergraduate teaching in pediatrics is carried out mainly during the fourth year of the medical school curriculum. Third-year students are given only a lecture course of seven hours covering elementary principles of infant feeding and the examination of normal infants.

During the fourth year a clinical lecture of an hour and a half is given by the head of the department to the entire class. This constitutes all the required work in pediatrics. However, an elective course is offered, and is in point of fact taken by the majority of the class, which gives a more intensive training. Students taking the electives work in the Harriet Lane Dispensary under supervision every afternoon for two months; in addition to this they are given an informal clinic during this period for an hour each morning. Arrangements are also made whereby students who so desire can work in some of the well-baby clinics in the city.

Staff exercises of various kinds are held regularly, in which the entire house staff and departmental staff participate. Special ward rounds to discuss cases of particular interest are held twice weekly. A staff conference is held once a week at which members of the department or of other departments in the institution discuss problems of current interest. A joint conference with the x-ray department is held once a week in which x-ray films of particular interest are exhibited and discussed. A clinical pathologic conference is held once a week in which recent autopsy material is presented. There is also a weekly history meeting at which recently discharged ward cases are reviewed and discussed.

Formal instruction for postgraduates is not offered at Johns Hopkins. Visiting physicians are always welcome to attend ward rounds, the various staff exercises, and the student clinics. Arrangements can usually be made for work in the out-patient department for those who wish to stay a sufficient length of time.

. . . . . .

In requesting this series of articles on pediatric clinics the Editor of the Journal expressed the hope that it might prove of value to the physician wishing to secure a more intensive training in pediatrics. The writer shares this hope. But it seems to him a pity to dilate upon the material attributes of a clinic without mentioning—at least in passing—intangible factors which in his opinion are of far greater importance in determining an individual's choice of a clinic in which to work. In an admirable essay[5] which has been published under the title "The Soul of the Clinic" the late Francis W. Peabody pointed out the attributes of a head of a department which determine so largely the success of the enterprise. What the student of

pediatrics would really like to know about a clinic is what manner of men comprise its personnel. It is the writer's belief that in the last analysis clinics will be judged by their "soul" rather than by their "anatomy" or "physiology."

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Critical Review

CHILD HEALTH 1933-1934

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NEW HAVEN, CONN.

IT IS the purpose of this review to set forth certain pertinent facts regarding the depression and its effect on child health and on child health services, to point out some of the steps that have been taken to stimulate interest in these problems, and to attempt to safeguard the health of children in the future. The past winter, 1933-1934, marked the fifth of the depression. The accumulative effect on children of inadequate food, too little medical care, and lack of security has become more and more apparent. That the facilities for meeting the health and medical needs of children the country over are far from adequate scarcely needs to be said. It may be well, however, to remind those who live in centers of population well provided with physicians, pediatricians, child health conferences, and public health nurses that in many parts of the country there are still numerous communities with little or no such service available for children and that in some sections there are large areas wholly unprovided with any sort of medical or nursing service, to say nothing of specialized care for children. Even in normal times the need for more adequate child health work was great; the depression has increased it many times.

With the increase in unemployment from 1929 to 1933, there has been a steady and rapid increase in the number of families seeking support through public or private relief agencies. At the same time, there has been a vast increase in the need for medical care and for health supervision of mothers and children in families who were unable to pay for such service. An indication of the burden that has been put on public and private funds by this great increase in the relief load is given in Chart 1 which shows the trend in amounts expended from public and private funds for all types of relief in 120 cities and city areas from January, 1929, through March, 1934.[1] The rapid decrease in the expenditure for relief from November, 1933, to January, 1934, may be accounted for largely by the number of individuals taken from relief rolls and employed under the Civil Works Administration. The rise in March, 1934, was coincident with the decrease in the civil works program.[2] A similar chart showing the trend in the number of families receiving relief in these 120 cities cannot be given because duplication in the reporting of families receiving relief from more than one agency has rendered the figures from many communities valueless. Studies of a smaller group of cities for which duplication in counts could be avoided

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indicate, however, that the trend in number of families on relief rolls has, in general, followed fairly closely that of the amounts expended for relief.[3]

A study[4] made by the Federal Emergency Relief Administration of the relief situation in October, 1933, showed there were 3,134,678 families and nonfamily persons receiving relief from public funds during that month, involving altogether nearly 12,500,000 persons. The study further showed that 42 per cent of these persons were under sixteen years of age, a figure that was considered particularly significant by the Federal Emergency Relief Administration because, according to the 1930 Census of the United States, children under sixteen years made up in that year only 31 per cent of the total population. In other words,

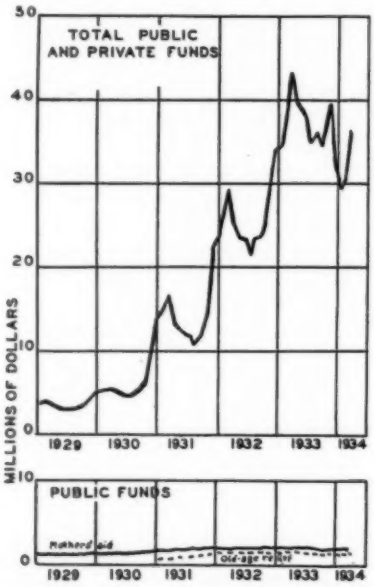

Chart 1.—Amount expended from public and from private funds for different types of relief in 120 urban areas in the United States from January, 1929, to March, 1934.

there were in October many more children in the families who sought relief than there were in the families in the United States as a whole. The report shows there were 5,184,272 children under sixteen years of age in these relief families, including 233,822 infants under one year of age and 1,589,480 children from one to five years of age, inclusive. These figures do not, of course, include the children in families of the unemployed who had not sought relief, a group reported by many social and health workers to be in at least as urgent need of health supervision and medical care as the children in families receiving relief.

With such a load thrown on the public and private relief agencies, the tendency has been to spread relief thin, and it is not surprising that it has not been adequate in many instances to meet the food needs of the children or to provide medical care. Actually the amount of relief given

in some communities has been so low that only a very inadequate diet could be provided with little or nothing left for clothing, shelter, and medical care. In many regions, however, the level of relief has gradually been raised. In January, 1932, for instance, the average monthly relief given in 124 urban areas reporting to the Children's Bureau was $17.66[5]; in January, 1933, it was $19.37 in 110 urban areas, while in January, 1934, the average monthly relief had risen in these same areas to $22.32.[6] Though these figures indicate that there has been a definite improvement in standards of relief during the past two years, the relief given in many communities is still far below that required to provide adequate food, shelter, clothing, and medical care. In this connection it is encouraging to find reported in the press recently[7] that in one large city an average monthly allowance of $47.78 was given during the month of March, 1934. A continued improvement in the general level of relief given must occur if children in relief families are to be adequately fed.

Medical care for the children in families on relief living in cities and towns has been given to a considerable extent through free clinics and dispensaries where such have already existed. Private physicians, however, have borne a large portion of the burden of this free care, especially in towns and rural communities where no free clinics are available. In this connection it may be pointed out that Perrott, Sydenstricker, and Collins[20] have shown that the amount of care received from physicians either in practice or in clinics by families who have suffered most from the depression has been considerably less than that received by "their more fortunate neighbors" whose incomes have not been so reduced. In the early fall of 1932, the New York State Temporary Emergency Relief Administration put into effect a plan for payment of physicians, dentists, and nurses for the care of relief families. In the summer of 1933 the Federal Emergency Relief Administration authorized state relief administrations to use federal funds for medical care under a set of rules and regulations drawn up to safeguard the procedures.[8] As a result, plans for the giving of medical care to families on relief have been drawn up under these rules in many states by the state relief administrations in consultation with the state medical associations and are now in more or less successful operation. The administrative plans of procedure and the schedules of fees have, of course, varied to some extent from state to state. Under these plans medical care may be given to children as well as adults in families on relief, but, in general, such care has had to be limited to acute conditions or to correcting conditions seriously interfering with growth and nutrition. Some states have not as yet adopted such a plan, and, within certain states, individual counties may not have done so even though the majority of the counties have. Under these rules and regulations for medical care, payment for health examinations of children has not been permitted.

During the third and fourth winters of the depression much interest was shown and many speculations made with regard to the effect the depression was having or had already had on the health, nutrition, and medical care of children in families of the unemployed. The continued decline in the infant mortality rates for the country as a whole and for many states and cities and in the death rates from tuberculosis and other communicable diseases were repeatedly cited as evidence that the health of the people of the country was better than ever before. Mortality rates, however, do not provide a complete or adequate measure of the

effect of the depression on child health. The actual condition of the children themselves, their nutrition, their growth and development, and the illnesses from which they suffer must be taken into consideration when judging the effect of economic conditions. Moreover, mortality data are not so collected that comparisons may be made between the rates for those sections of the population that are known to have suffered from prolonged unemployment and the rates for those sections of the population that have continued in full-time employment. Though the number of individuals seriously affected by the depression is vast from the point of view of providing relief, it represents but a relatively small proportion of the total population, and changes in the mortality rate of this group may have been masked by continuation of the general downward trend in that larger proportion of the population that has at no time reached the level of real economic want.

During the second winter of the depression in certain isolated areas where unemployment had been widespread for a number of years, there were found undoubted evidences that children were suffering from lack of food and medical care. At this time, however, though social workers and others in industrial cities and towns and in certain of the drought areas were beginning to come in contact with more and more children who were obviously showing the effects of deprivation, there were no figures available showing the effect of the depression on large groups of children or on the child population as a whole. During the winters of 1931-32 and 1932-33, with the prolongation and intensification of the depression, the effects on groups of children gradually became manifest. Though the data available were to a large extent fragmentary, nevertheless, by the summer of 1933, the weight of evidence that had accumulated[9, 10, 11, 12, 13, 14] pointed unmistakably to the fact that both malnutrition and illness were increasing among children as a result of the depression. It was, of course, appreciated that figures from one community were not necessarily applicable to another, and because the effects of privation were demonstrable in one region, it did not necessarily mean they existed in another. Figures based on the examination of children in families "on relief" could not be applied to children in families not in need. Estimates of undernutrition or malnutrition made by one group of physicians could not be compared exactly with those made by another. During the summer and fall of 1933, three investigations were reported verifying to a great degree previous impressions.

Early in the summer of 1933 a report, "Idleness and the Health of a Neighborhood,"[14] was issued by the Association for Improving the Condition of the Poor in New York City; it was based on the results of two surveys in the Mulberry Health District—one in November, 1930, and one in April, 1932. In its summary the report states "the evidence seems conclusive that in both April, 1932, and November, 1930, the unemployed portion of Mulberry's population suffered more sickness than the employed." In the section dealing with the study of children under six years of age it is pointed out that, for every 1,000 children visited in April, 1932, 259.9 were said to be sick, whereas in November, 1930, the corresponding rate was 91.2, the difference representing an increase of 185 per cent in the sickness reported. Even if colds, which may not have been as well reported in 1930 as in 1932, are eliminated, there remains a rate of 199 per 1,000 in 1932 as compared with 90.2 in 1930. Though the 1932 survey followed an epidemic of measles, the high sick-

ness rate in 1932 cannot be accounted for by an epidemic of any communicable disease at the time of the survey. The total sickness rate for children under two years of age was shown to correspond to variations in economic status of the family. For children between the ages of two and six, however, the association between sickness and the economic situation applied to some diseases but not to others. Malnutrition in this group of preschool children did not appear to vary with adequacy of family support. The investigators point out, however, that this latter finding is not consistent with the general trend of the survey findings in 1930 and 1932 which showed an increase in the rate of malnutrition among children under six years of age from 60.3 per 1,000 in 1930 to 99.0 per 1,000 in 1932. Moreover, examinations of preschool children at the Mulberry Health Center by physicians showed an increase from approximately 18 per cent in the years from 1927 to 1929 to approximately 38 per cent in the years from 1930 to 1932. A number of suggestions are offered to explain the apparent lack of correspondence between the rate of malnutrition and the employment status of the household, such as variation in physician's diagnosis of malnutrition and the more adequate diet and care given through the Health Center to children in families in the most unfavorable economic status. The conclusion is reached: "In spite of these circumstances, however, child health has undoubtedly suffered in Mulberry during the depression." Furthermore, the study showed that the rate for sickness receiving no medical care by physicians in 1932 was four times that in 1930, whereas the rate for sickness receiving medical care increased hardly at all. In April, 1932, only one in every four children under six years of age received medical care at any time during the course of the present illness, whereas two out of five of the total sick population studied received such care.

In October, 1933, there was issued the first of a series of reports by Perrott, Collins and Sydenstricker[15, 16, 17, 18, 19, 20, 21] dealing with a comprehensive investigation of "Sickness and the Depression" in ten localities including the poorer districts in eight large cities, a group of coal mining communities, and a group of cotton mill villages. The findings reported to date are the best statistical data available that have to do with the effect of the depression on health in the United States. Certain of the data are given by age groups and give information about children. The reports so far cover the relation of economic status in 1932, change of income from 1929 to 1932, and employment status in 1932 to the incidence of disabling illness during a three-month period in the spring of 1933, to medical care received, to malnutrition in a group of 1,000 school children, and to birth rate. In addition dietary studies were made of a number of families in each area. The population surveyed was composed largely of families in the wage earning class, a considerable proportion of which had experienced loss of income due to unemployment and wage reductions. The basic data so far reported for five cities[17] show a marked shift in income during the four years studied; in 1929, 13 per cent of families were classified as "poor" (annual per capita income less than $150) and 37 per cent as "comfortable" (annual per capita income $425 and over), whereas, in 1932, 51 per cent were classified as "poor" and less than 10 per cent as "comfortable." Study of the illness rate for disabling illnesses beginning within the three-month study period showed that among some 34,000 persons studied in eight cities,[18] the rate was

nearly 40 per cent higher in 1932 for the "poor" families than for the "comfortable" ones and that, more striking still, the illness rate was more than 60 per cent higher among members of families whose incomes had dropped from "comfortable" to "poor"—the so-called "depression poor"—than among members of families who were in "comfortable" circumstances throughout the four years. Analysis of the data by age groups[17] showed that the same facts held true for children as for adults, the total sickness rate for the youngest group being much higher for children of the "depression poor" than for children of the families who suffered no drop in income. Furthermore, the children under 15 years of age among the "depression poor" showed a much higher rate for respiratory diseases (120 per 1,000 children) than did children of the same age in families who remained in comfortable circumstances (55 per 1,000 children).[19] The difference was not evident in the communicable diseases of children, such as whooping cough, measles, mumps, etc. At each age level also, there was a direct relation between the unemployment of the family and the illness rate, the rate for persons in families with no unemployed members in 1932 being lower than that for persons in families with only part-time or no employment.

In the same way the reports[20] show that the members of families of the so-called "depression poor" received strikingly less care from physicians, either as private practitioners or in clinics, than did their "more fortunate neighbors" whose incomes had not dropped. The difference was largely due to a decrease in the amount of pay care that the "depression poor" received which was not made up for by a similar amount of free care. Moreover, though the "depression poor" received much more free care from visiting nurses and more free hospital care than did their neighbors who remained in comfortable circumstances, they did not receive nearly as much as did the "chronic poor." The authors suggest that the "depression poor" had not made as good connections with sources of free care as had those who had been poor since the beginning of the depression.

Furthermore, it was shown[21] that the birth rate was highest in families which were without employment or on part-time work in 1932 and that this was true for unskilled, skilled, and salaried workers alike. The birth rate was highest among the chronically poor, but it was also shown to be considerably higher among the "depression poor" than among the families who did not suffer a drop in income. No data on infant mortality rates have been reported.

As part of the investigation, Kiser and Stix[22] examined carefully 1,000 school children from families in poor areas of New York City and Pittsburgh in order to study the relation of malnutrition to economic status and loss of income. Only figures for 514 school children examined in New York are so far reported. More than 40 per cent of the children from families in the lowest income group at the time of the investigation in 1933 (less than $4.00 per capita per week) were classified as having "poor" and "very poor" nutrition, in contrast to only 24 per cent of the children from families in the highest income group ($6.00 or more per capita per week). The investigators point out also "that a lowering of nutritional status appears to be associated with a drop in family income in as short a time as a year." They state, furthermore, "that the proportion of children suffering from malnutrition in the group examined appears to be considerably larger than the proportion of mal-

nourished children we should expect to find in a nondepression era. While we have no records for other groups of children which are directly comparable with our data, the difference in the prevalence of malnutrition among children of lower income families as compared with that among children from the highest income families, in which there has been relatively little change in income since 1929, is definitely shown for the group included in this study."

Studies by Wiehl[23] of the diets of several hundred families in New York City, also made as part of the larger investigation, indicated that, as income declined, the average consumption of each type of food in the dietary was reduced, but the greatest reductions were in the use of milk, meat, fish, eggs, and vegetables and fruits. The resulting diets lacked balance. The diets of families on home relief contained better proportions of the various nutrients than those of work-relief families or of families with lowest income not on relief, but the milk supply was somewhat below that recommended for a low-income diet.

From these studies it would appear that increase in the rate of disabling illness for children and adults alike, increase in malnutrition among school children, decrease in the amount of medical care received, and increase in the birth rate were closely associated in the populations studied with drop in income during the four years of the depression studied. The investigators warn against general application of these findings to all wage-earning groups until the complete data are analyzed. There has been no report so far on the data from coal mining and cotton mill areas.

A third investigation that has a direct bearing on the question of the effect of the depression on child health and development is one made by Palmer.[24] The study was undertaken with the purpose of determining whether or not the weights of elementary school children in Hagerstown, Md., differed in 1933 in significant particulars from the weights of children of the same sex and age and living in the same city during the past decade. Comparison was made of the weights of school children in May, 1933, with those of school children weighed in May each year from 1921 to 1927. The study showed first that the average weight of children in the two periods presented no consistent or statistically significant differences and that, though the variability of body weight (measured by the standard deviation) was not consistently different for boys for the two periods, that for girls was slightly greater in 1933 than in 1921-27. Comparisons of the percentages of boys and of girls found in 1933 and in 1921-27 to be 12 per cent or more below the mean weight of children in 1921-27 showed no statistically significant differences for boys between the two periods, but did show that if six-, seven-, eight- and nine-year-old girls were considered together, leaving out the ten- and eleven-year-old individuals, there was a significantly higher proportion underweight in 1933. Further study showed that in the totals of 1,245 boys and 1,269 girls, there were four fewer boys and forty-one more girls underweight in 1933 than would have been expected had the same proportions been underweight in 1933 in the various age-sex groups as were underweight in the 1921-27 period. It is concluded that the present economic depression is associated with a slight increase in the proportion of underweight elementary school girls.

However, when these same children were classified according to the employment status of their families and according to whether or not they

were receiving relief directly in the home or indirectly through school lunches, differences in weight became apparent. The children in families with no employment or only part-time employment weighed from 1.5 to 4 pounds less on the average than did those in families of the regularly employed, and the children who received free lunches at school or whose families were receiving welfare aid weighed from 2.5 to 9 pounds less than did those not eligible for free lunches or whose families did not receive aid. The investigators point out that these differences are approximately the same as those usually found between the higher and lower economic classes and conclude that "a welfare agency which gives its funds toward support of children who average 2.5 to 9 pounds below the weight of other children in the same community is, in fact, probably giving aid to those children who are actually most in need of it."

Although the weight differences for the total number of children studied by Palmer in 1921-27 and in 1933 are small and appear to show but little effect of the depression on school children in Hagerstown, nevertheless, the differences brought out by him, as well as by others cited by him, between the weights of children in families of the unemployed and underemployed and those of children in families with regular employment are cause for serious concern for the growth and development of many children—not only the five or six million children in families now on relief, but also the many others in families of the underemployed whose financial circumstances have been materially reduced for long periods of time.

CHILD HEALTH APPROPRIATIONS 1933-34

Accurate data regarding the changes in appropriations or expenditures for child health work by private agencies are not available, partly because the cost of child health activities is often not separated from that of other activities and partly because it has not been possible to keep up to date records of the number of public health nurses employed for child health work either in a generalized program or in a specialized one. There have been, however, many reports of reductions in appropriations for nurses and for child health conferences maintained by private contributions. During the year 1933 it has been increasingly difficult for privately supported health agencies to continue their full amount of work done. Furthermore, the increased burden of bedside nursing thrown on these agencies by the depression has affected the volume of child health work. In some public health nursing agencies the urgency of the situation has resulted in reorganization of methods to permit the nurses to give more child health instruction to mothers in group conferences than at home visits.

Exact information is also lacking with regard to changes that have taken place during the past few years in appropriations and expenditures for maternal and child health by public agencies in cities, towns and counties. Decreases in public appropriations for all public health activities have, however, occurred in many cities and towns. Reports made to a committee of the American Public Health Association[25] show that there were reductions in appropriations in 1933 as compared with expenditures in 1931 in fifty-six out of sixty-two of the large cities reporting. These reductions amounted to 18 per cent on the average and ranged from 47 per cent to 2 per cent. That these and similar reductions in smaller cities and in towns have affected the child health work

in many instances, as well as other aspects of the public health program, is, of course, very probable. When reduction of appropriations are such that public health nurses are dismissed, the number of maternal and child health conferences reduced, and medical examinations of school children eliminated, as has happened in many communities, much of the value of many years' work in the establishment of such health services is lost. Reports of reduction in the number of school nurses employed by local boards of health or education have come from many parts of the country. Many counties that formerly were able to support at least one public health nurse for maternal and child health work, either in a generalized or specialized program, are now without any. Taking into consideration, moreover, the fact that in certain large counties in some of the rural states there may be but one physician, or none at all, to cover several hundred square miles of territory, it is perhaps easier to appreciate the value of even one public health nurse in such a community and what her loss means in terms of maternal and child health work alone.

Data with regard to changes in appropriations and expenditures by state health departments for child health activities are more complete. Recent reports received from state health officers give the following information regarding expenditures for child health activities in 1932 and 1933 and appropriations for the current fiscal year, 1934.

Expenditures in 1933 as compared with those of 1932 showed an increase in three states, no change in twelve states, and a decrease in twenty-eight states, in four of which the appropriation was completely eliminated in 1933. Five states had no appropriation for child hygiene in 1932 or 1933.

The appropriations for 1934 as compared with the expenditures for 1933 showed an increase in six states (three increases over the budgets of 1932 and 1933, and three partial restorations of cuts in 1933), no change in fourteen states, and a decrease in nineteen states (nine being the first reductions since 1932, nine additional to cuts in 1933, one partial withdrawal of a 1933 increase).

From 1932 to 1934 there was a net increase in only four states, no change in two, a net decrease in thirty-seven. Five states had no appropriation in 1932, 1933, and 1934, and four others had none in 1933 and 1934. The net decreases for the thirty-seven states ranged from 100 per cent in four states to 5 per cent in one state.

The actual expenditures in 1932 and the appropriations for 1934 for the maternal and child health activitites of the state departments of health are shown in Chart 2 for the forty-eight states. The chart shows that for the current fiscal year, 1934, there are nine states with no appropriation for child health work (Arkansas, Colorado, Indiana, Nebraska, Nevada, Oklahoma, Utah, Vermont; New Mexico has no special appropriation), eight with an appropriation of less than $5,000 (Alabama, Idaho, North Dakota, Oregon, South Carolina, Tennessee, Washington, Wyoming), six with $5,000 but less than $10,000 (Florida, Iowa, Kansas, Louisiana, South Dakota, West Virginia), fourteen with $10,000 but less than $30,000 (Arizona, California, Connecticut, Georgia, Kentucky, Maine, Maryland, Mississippi, Missouri, Montana, New Hampshire, North Carolina, Ohio, Rhode Island), six with $30,000

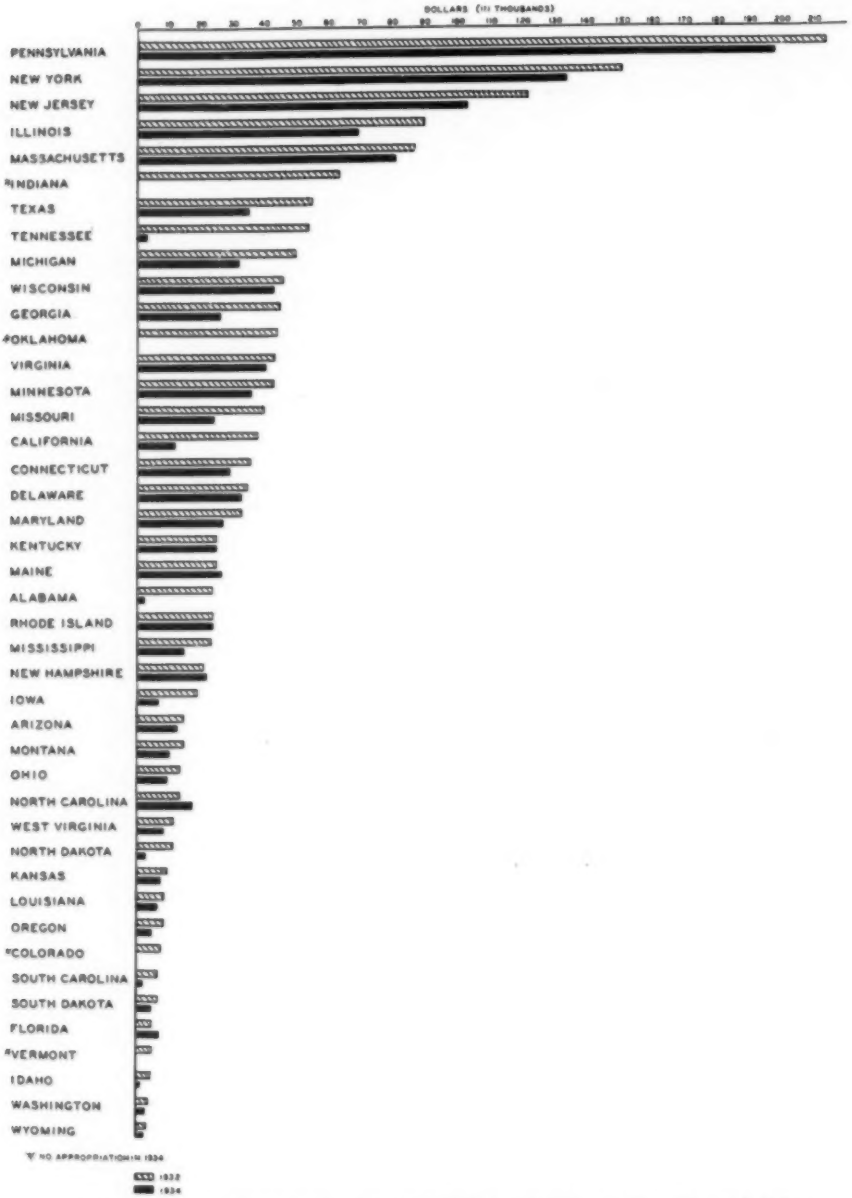

Chart 2.—State appropriations (in thousands of dollars) for maternal and child health activities in 1932 and 1934.

Five states, Arkansas, Nebraska, Nevada, New Mexico, and Utah, had no appropriation from 1932 to 1933.

Crosshatched bars show appropriations in 1932. Solid bars show appropriations in 1934. Asterisk indicates no appropriation in 1934.

to $50,000 (Delaware, Michigan, Minnesota, Texas, Virginia, and Wisconsin) and five with more than $50,000 (Illinois, Massachusetts, New Jersey, New York, and Pennsylvania).

There is little need for comment either on the reductions in these state appropriations or their present size. If leadership is to be taken in state-wide child health activities by the state departments of health, adequate appropriations must be made to provide trained personnel. In only eighteen states is there as much as $25,000 appropriated annually for this work. In this connection it may also be pointed out that in only twenty-two states is there at the present time a full-time physician in charge of the division of child hygiene; in nine others either a nurse or a physician who is largely occupied with some other phase of public health work is in charge of child health activities. Seventeen states have no special division of child hygiene.

CHILD HEALTH ACTIVITIES 1933-1934

During the year 1933 and the winter of 1933-34 child health activities have been continued on a state-wide basis to the extent permitted by the appropriations made to the state departments of health for this purpose or as unassigned funds have been used. The usual type of activity has been continued as far as possible by each state, and in a few states there has been no decrease in personnel or scope of work. In several, special surveys have been undertaken in selected counties or of special groups of children to determine the need for more extensive work. The large reductions in funds during the last two years, however, or their complete elimination, has seriously handicapped the maternal and child health work in a number of states. It has been necessary to reduce the staff of supervisory and field nurses in many states, to cut down or eliminate the prenatal and child health conferences, to curtail to a great extent the educational work with parents, students, and others. The reduction in funds for travel has, in certain of the larger states, seriously handicapped the work of the personnel that have been retained on the staff. There is no way of estimating at present the total loss to child health through the elimination or reduction of these state-wide educational and advisory activities or through the reduction of medical examinations and follow-up care by nurses for mothers and young children in states and communities where but little of such work is still carried by local groups. At the very time when increased need among families of the unemployed has called for increased help of the type that can be rendered to counties and local units by a well-staffed state child hygiene division, the reductions in personnel and funds have occurred, not only preventing new work from developing, but often eliminating the routine activities. The fact that communicable diseases have been controlled and that mortality rates have continued to decrease speaks well for the maintenance of public health activities that have to do with these phases of health even in the face of very great odds. Those aspects of child health work, however, which are most seriously interfered with by the reduction in the activities of the child hygiene division, that is, work in nutrition, general hygiene and mental health, are the very ones in which an increase is made imperative by the economic depression.

PENNSYLVANIA EMERGENCY CHILD HEALTH ACTIVITIES

Because of reports of serious increases in malnutrition among children in many areas in Pennsylvania that were brought to him by the state medical society, the State Board of Health, and the Emergency Relief Board, Governor Pinchot called together a large number of individuals interested in children for a conference on malnutrition early in February, 1933. The facts presented at this conference regarding the great increase in numbers of families on relief and the reports of increasing malnutrition led the Governor to ask the Pennsylvania Medical Society to nominate persons for appointment by him to state and county Emergency Child Health Committees and to formulate a plan and direct the work necessary to meet the situation.[26] The state committee included representatives of the State Medical, Dental, and Nurses Associations, the Academy of Pediatrics, the State Emergency Relief Board, and a number of other professional and lay groups interested in child welfare, nutrition, and other special health fields. County committees, similarly composed with a member of the County Medical Society as chairman and a member of one of the women's organizations as vice chairman, have been organized during the past year in thirty-nine of the sixty-six counties of Pennsylvania, exclusive of Philadelphia. In thirty-seven counties programs of health examinations are in progress.[27, 28] To assist the chairman of the state committee in organizing these county committees and in getting the work under way, a physician was appointed as full-time vice chairman.

The program of the Pennsylvania Emergency Child Health Com mittee consists, first, of child health examinations with appropriate follow-up to correct the physical defects found and, second, of an educational program in the field of nutrition conducted through the medium of home economics committees in the counties. The first procedure of each county committee has been to organize health examinations of children in families on relief, located through the county Emergency Relief Boards, and of children in families on the borderline of relief. More than 30,000 such children had been examined by physicians up to February 1, 1934, largely in their private offices. An examination form including necessary data for a "study of the entire child" was prepared by the state committee for the use of physicians in each county. Analysis of the first 26,000 records showed that 27 per cent of the children examined were suffering from malnutrition, ranging from 5 per cent of the group examined in one county to 40 per cent of the group in others. In ten of the twenty-seven counties more than 30 per cent of the children were reported as undernourished. A large number of children were found to be in urgent need of tonsillectomy and of dental care, and a great majority of all children examined had never been protected against diphtheria. Of children under six years of age, 79 per cent had not been protected against diphtheria, and 80 per cent were not vaccinated against smallpox. In all of the organized counties active steps are being taken to insure better diets for the undernourished children, to arrange for dental care, for tonsillectomies, and for immunization. Special efforts are being made to reach all pregnant women on relief rolls and to arrange for the necessary prenatal care and physicians' examinations.

The work of the home economics committees is largely educational. The committees include extension workers, teachers of home economics

and dietitians. Demonstrations are held in groups and at home to show mothers how to prepare and use the foods provided by the Emergency Relief Board so as to provide a well-balanced ration for the children and to make the foods provided last out the week. In some counties the services of these committees are also given to families on the borderline of relief.

In a recent report[26] the chairman of the committee pointed out: "One of the most outstanding accomplishments of the Emergency Child Health Committee has been the bringing together of all interested agencies within the counties under medical leadership. It has smoothed out the differences which far too frequently exist between these agencies; it has established a community of interest; it has eliminated duplication of effort; it has enabled us to increase the effectiveness of all groups; and it has established a child-health consciousness within the counties, which gives great promise for the health status of Pennsylvania's children in the years to come."

CHILD HEALTH RECOVERY PROGRAM

On the call of the Secretary of Labor, a national conference[29] was held in Washington, October 6, 1933, under the auspices of the United States Children's Bureau for the purpose of stimulating public and professional interest in the health of children who had suffered as a result of the economic depression and of making sure, while plans were being formulated to bring about economic recovery, that the health needs of children should not be overlooked. Appreciating the diversity of organizations, both public and private, that have an interest in the problems of child health, the Secretary of Labor appointed an Executive Committee* to consider the objectives of a National Child Health Recovery Program and to make recommendations to the conference. The committee met in all-day session a month before the conference and discussed in detail the objectives and possible plans of procedure of national and state programs. Though the Federal Relief Administrator was unable himself to be present, the question of providing adequate home relief for families in which there were found to be undernourished children and medical care for children in families receiving relief were discussed fully with his representative.

The nucleus of the conference was made up of representatives from forty-three state health departments. In addition, there were present representatives from national and state associations of medicine, pedi-

*The members of this committee were: Mr. Harry L. Hopkins, Federal Relief Administrator; Dr. Hugh S. Cumming, Surgeon General, Bureau of the Public Health Service, Department of the Treasury; Dr. Louise Stanley, Chief, Bureau of Home Economics, Department of Agriculture; Dr. George F. Zook, Commissioner, Office of Education, Department of the Interior; Dr. Frederick D. Stricker, President of the Conference of State and Provincial Health Authorities and Executive Secretary, Oregon State Board of Health; Dr. A. J. Chesley, Secretary of the Conference of State and Provincial Health Authorities and Executive Officer, Minnesota State Department of Health; Dr. Elizabeth M. Gardiner, Director, Division of Maternity, Infancy, and Child Hygiene, New York State Department of Health; Dr. Mary Riggs Noble, Chief, Preschool Division, Pennsylvania State Department of Health; Dr. Lillian R. Smith, Director, Bureau of Child Hygiene and Public Health Nursing, Michigan State Department of Health; Mr. Homer Folks, Secretary, State Charities Aid Association, New York City; Dr. Kenneth D. Blackfan, Professor of Pediatrics, Harvard Medical School and Member of the League of Nations Committee on Malnutrition and the Depression; Miss Katharine F. Lenroot, Assistant Chief, Children's Bureau, Department of Labor; Dr. Martha M. Eliot, Director, Division of Child and Maternal Health, Children's Bureau, Department of Labor; and the following members of the Advisory Pediatric Committee of the Children's Bureau—Dr. Howard Childs Carpenter, representing the American Child Health Association; Dr. Samuel McC. Hamill, representing the American Academy of Pediatrics; Dr. Julius Hess, representing the American Medical Association; Dr. Richard M. Smith, representing the American Pediatric Society.

atries, dentistry, public health, nursing, home economics, education, relief, public welfare and social service, representatives from many lay organizations, and various individuals interested in the fields of child health and nutrition.

The following objectives and recommendations of the Executive Committee were summarized and presented to the conference.

"After consideration of the evidence available with regard to the present health needs of children your committee recommended that a program be instituted that should have the following objectives:

First: The location of undernourished children.

Second: The initiation and development of plans to overcome, as far as possible, existing malnutrition and the prevention of its further progress through dietary measures and in so far as necessary the institution of corrective medical procedures.

"To promote such plans as may be decided upon as necessary to meet situations within different states and communities it became evident to the committee that it would be necessary to have the full and complete cooperation of the state and local departments of health, welfare, and education, the national, state and local emergency relief administrations, the state and local medical and dental societies together with the official and nonofficial national, state and local agencies concerned in the promotion of public health and child welfare.

"To facilitate such cooperation, the committee recommends the organization of state, county, and local committees, each committee being so constituted as to include in its membership representation from each of the official and, so far as seems advisable, the nonofficial groups above indicated.

"In communities where groups similarly constituted are already organized to further the objectives of the program, the continuance of their work should be encouraged and supported.

"For the further fulfillment of these plans the committee makes the following suggestions:

1. Due consideration should be given to the needs of children in families on relief and those in families who though not on relief are nevertheless in need.

2. Under the term children, infancy, early childhood, the school child and the adolescent should all be given consideration.

3. A physical examination form with accompanying interpretive information shall be issued by the Children's Bureau to insure a degree of uniformity in procedure.

4. Provision should be made for the payment of a small fee for such physical examinations. Fees for the necessary correction of defects should also be provided. Previous experience has shown that the payment of a small fee assures a greater degree of uniformity of examination and expedites the effort."

Previous to the conference, the question of the payment of fees for health examinations of children in families on relief was taken up with the Federal Relief Administrator. Though the value of the payment of such a fee in promoting health examinations as part of the Child Health Recovery Program was appreciated, it was decided that authorization for such payments could not be given. Authorization for payment for school

lunches from federal unemployment relief funds was approved, however, and announcement made the day before the conference was held.

It was pointed out at the conference[30] that, in proposing a nation-wide effort to locate malnourished children, it was not the purpose of the Children's Bureau to recommend a program of investigation or research to determine the incidence of malnutrition or the extent to which it had increased in recent years, but that the Bureau was concerned solely that ways and means be devised whereby individual children suffering from lack of proper food or medical care might be located and their needs supplied, hoping, moreover, that the effort might also stimulate communities and states to a realization of the importance of adequate diet and care for all children whose families have been suffering from economic disaster. It was further pointed out that communities would be encouraged to undertake the examination of children from those groups of the population in which the undernourished are most likely to be found, namely, the families on relief and the families who though not yet on relief are, nevertheless, in need. Various plans of procedure for state-wide and local programs[31] were presented at the conference, including that already in operation in Pennsylvania, the New Jersey plan for the joint organization of State Medical Society and Bureau of Child Hygiene of the State Department of Health through which, it was believed, a program could be undertaken, and in addition a suggested plan of organization under a State Health Department giving details of cooperation with various state departments and other agencies and of necessary committee arrangements for putting the program into effect.

Following the conference, the Children's Bureau made available three physicians for consultation work with various state groups and later added to its staff two other physicians, both of whom were experienced in the organization of state-wide child health activities. In addition, the American Child Health Association loaned the services of their medical director for part time for three months. In assisting to formulate programs for the different states no fixed plan of procedure has been followed and cognizance has been taken of the variations in the needs of the states, the present organization for child health work, official and nonofficial, the personnel available for state or county work, the ability of state and local groups to organize and finance further activities, and the assistance that could be obtained from state and local relief administrations and from nutrition workers to insure adequate diets. Joint action on the part of the child hygiene divisions of state departments of health with state medical associations and pediatric organizations has been sought wherever feasible and state committees or councils on child health have been formed in a number of states. These committees have usually included in their membership representatives from the state health departments, the state medical, pediatric, and dental associations, the state nurses associations (especially the public health section), the state relief administrations, the state departments of public instruction, the extension services, nonofficial agencies active in the field of public health or child welfare and lay organizations such as the parent-teachers' associations, women's organizations, farm bureaus, etc. In some cases groups of individuals have come together less formally, largely with the purpose of getting a plan under way. Where, however, formal state or local committees have been organized the plan of procedure has usually been more effective. This is especially true in the development

of local community plans. In many counties the local committees have been instrumental in developing strong public opinion in favor of a permanent program for child health. These county or community committees have been variously organized—sometimes by the county medical society, sometimes by the county relief administrator or health officer, sometimes by a public health nurse or interested lay group—but in each case effort has been made to have all interested professional and lay groups represented. The appointment of subcommittees on medical procedure has been urged.

The value of repeated health examinations by physicians as a major part of a child health program was emphasized at the Child Health Recovery Conference and a program of examinations was urged, not for the collection of statistics, but as a part of the child health service that should be available in any community. Since it was not possible to provide a fee for such examinations, it was, of course, obvious from the first that it would not be practical to attempt to arrange for medical examinations of all children and various methods of selection of those most in need were discussed by the executive committee and later at the conference. The recommendation of the committee that consideration be given to children in families on relief and those in other families in need though not on relief was made partly with the idea of confining the examinations, certainly at the start, to a group that was definitely in need. It was also clear that some other selective measures would have to be applied. To this end the plan that had been tried in Detroit, that of having the school-teacher make the initial selection on the basis of her observation of the child and her knowledge of his home conditions was described at the conference. A physical examination form that allowed for two examinations and that stressed the nutritional aspects of the child's physical condition was provided by the Children's Bureau for free distribution to those states or communities that wished to use it. In some places this form has been used by the nurse who has checked certain items at her inspection and later by the physician when he made his examination.

The two chief handicaps to the development of state-wide plans has been the lack of full-time medical and nursing personnel and the difficulty of arranging for correction of physical defects. In those states where experienced physicians and nurses have been available for direction of the work and where state-wide programs had been carried successfully in previous years, the development of a plan of procedure was relatively simple, but even in some of the best organized states the actual carrying out of a program has been difficult because of the great reduction in state and local personnel. The need of a full-time physician to organize a program has been fully appreciated especially in states where there is no regular state director of child health activities. The success of the work of the Pennsylvania Emergency Child Health Committee is due in no little measure to the fact that the chairman has been able to devote so large a portion of his time to the work and that a full-time physician, experienced in public health procedure, was engaged for the work of organizing the county medical society committees.

The lack of public health nurses who could assist in local organization, in the preliminary selections of children for medical examination and in the necessary follow-up was perhaps the greatest handicap to the development of a program. With the inauguration of the Civil Works

Service Administration in the middle of November, however, and the possibility of employing nurses for child health work, great impetus was given to the whole Child Health Recovery Program. In a few states individual nurses were employed and put to work under various local projects before the end of November, and in one state at least where the need was known to be very great, more than two hundred nurses were at once employed by the State Relief Administration under the supervision of trained public health nurses for a state-wide program that had to do largely with the nutritional needs of children.

Because of administrative difficulties in the selection of nurses and the provision of proper supervision and because of uncertainties with regard to the availability of funds, there were many delays in putting nurses to work. At the request of the Federal Civil Works Administration, the United States Children's Bureau agreed to act in the capacity of consultant in the organization of special state-wide child health nursing projects. During December and January such projects were organized in twenty-eight states under the state departments of health. In at least twelve additional states nurses were employed on a state-wide basis under the supervision of the state health department, the state department of education or the state relief administration, and in each some child health work formed part of the nurses' program; in several it formed the major part of their work. Altogether it is probable that nearly two thousand nurses, including approximately 200 qualified public health nurses as supervisors, were employed for varying periods of time during the months from January to May on some phase of child health work. Since the very great majority of these nurses had no previous training in public health work, emphasis was laid on the necessity of limiting their activities to some simple aspect of child health work, one for which definite and detailed instructions could be given in preliminary group conferences and in individual conferences.

A program of school inspections and consultations with parents and teachers with the idea of selecting those children most in need of more adequate diet or of medical examinations and care was recommended for these nursing projects. In many of the towns and rural areas to which these nurses were to be sent, the school was the logical center to which parents could come to talk over the needs of their children. Younger children have been brought to the school in many instances by the parents for consultation with the nurse. Arrangements with county relief administrators for the provision of milk or more adequate home relief, with nutritionists and extension workers for the development of a school-lunch program, or educational work with parents and with local physicians for medical examinations and care have been important parts of the nurses' work in many communities. In a number of states a program of prenatal care, especially among women in families on relief and others in need, has been included and, in a few, work with midwives.

The assistance and advice of extension workers, nutritionists, and teachers of home economics has been obtained in many states and communities. The authorization by the Federal Relief Administrator of the expenditure of federal funds for school lunches for children on relief gave great impetus to the establishment of hot lunches in schools in many states. Though theoretically home relief should be such as to provide adequately for children without having to supplement their diet with a school lunch, the provision of a well-planned meal in school, including milk, has unquestionably gone a long way to overcome exist-

ing undernutrition and to prevent its development in many thousands of children this winter. In this school feeding program, effort has been made to reach the so-called "borderline" cases, with a view to the prevention of serious malnutrition, rather than to feed only those known to be already in serious condition.

Though in general, emphasis has been placed on nutrition and medical care of children, immunization programs have also been carried in some communities and have formed the chief objective of the nurses' projects and, indeed, of the winter's child health program in several states. In at least two, state-wide programs of diphtheria immunization have been developed by the state medical associations working with the state health departments through the county or district medical societies. Nurses have been employed to assist in these immunization compaigns and in some communities have made house-to-house canvasses to determine the need for immunization among children.

Though for various reasons arrangements for medical examinations of all children who were in need of them have so far been impossible, nevertheless, many individual examinations have been arranged, much medical care has been given, and the diets for many children have been improved as a result of these programs. In some states active cooperation with state and county medical societies or with groups of physicians or individual physicians has resulted in a large number of examinations and in plans for the medical care of children found to be in need.

In those states where the relief administration has adopted a plan under the Federal Emergency Relief Administration rules and regulations governing medical care for families on relief, payments for the correction of medical defects seriously interfering with the child's nutrition or growth are being authorized, and some medical care is being given. Because of the fact that as a rule only emergency work is authorized, many needs are not being met that should be taken care of at once. Unless some plan is adopted in states not yet provided with one and unless there is some liberalization of the conditions under which medical work for these children on relief can be carried out, it is to be feared that many children will ultimately seriously suffer from lack of care, especially those in communities and rural areas where clinics are not available. That funds should be provided for the medical care of children who are sick or have remediable defects that interfere with nutrition and growth would seem to be a charge on the resources of state and nation that is a close second to that of providing food and shelter. Not less important, however, is the provision of funds to insure adequate health examinations for children in families unable to pay for such care.

Reports as to the number of children inspected by nurses, examined by physicians, or immunized against diphtheria or smallpox and of the number of children cared for or given school lunches are not yet available for many states, but those that have come from a few indicate that a considerable amount of work has been accomplished during the winter. For instance, one state that has concentrated on diphtheria immunization reports more than 100,000 immunizations completed; another state that has concentrated on nutritional activities reports for a period of five months more than 89,000 inspections by nurses, more than 20,000 medical examinations, and over 100,000 children regularly fed school lunches. From another state comes the report that 64,000

school children have been given lunches daily for a period of several months. Plans to continue the employment of nurses for maternal and child health work are being worked out in a number of states and special emphasis is being placed on work with children and mothers in families on relief and in other families in need because of unemployment. To safeguard the quality of work as far as possible, public health nurses will be employed whenever available, and in all cases trained or experienced public health nurses will be continued as supervisors.

It is, however, too early to attempt to record accomplishments, and complete figures will probably never be available. Impetus has been given to child health activities in nearly all states and in many individual communities. Many different types of work have been undertaken. Certain states that in recent years have had no state-wide organization for child health work have been able to form committees and, with the aid of the state relief administrations and other state and local organizations, have developed child health activities in many counties. In two states there have been appointed directors for the divisions of child hygiene in the state departments of health, one to fill a vacancy, the other a new appointment. In one state where there is no division of child hygiene, a pediatrician has been given a temporary appointment as director of the Child Health Recovery Program serving under the State Relief Administration. In eleven states, where there were no directors of public health nursing in the state departments of health, qualified public health nurses were appointed by the state Civil Works Administrations as directors of public health nurses and, in most cases, assigned to the state departments of health to direct the child health and other nursing programs. In a majority of states the child health programs have been organized on the basis of health service to mothers and children; in a few, special surveys have been undertaken to determine the need. Where such surveys have been made, the need of more adequate food and more medical care has for many children been demonstrated, and the desirability of extending the service has been shown.

CONCLUSION

During the year that has just passed several points have become clear. The enormous shift that has taken place in the past five years from the ranks of the employed to the ranks of the unemployed or underemployed and the subsequent inevitable lowering of standards of living are in themselves sufficient cause for concern regarding the present and future growth and development of the five or six or more millions of children affected. Moreover, there would seem to be little doubt any more that the depression has been having an adverse effect on the health and nutrition of many of these children. Since the effects are apparently cumulative, it is likely that they will continue to be felt for a considerable period after the depression has passed unless more active steps are taken to combat them than are possible with the present limited child health budgets and the relatively low standards of relief still prevalent in many communities. Joint action on the part of health and medical groups, together with those responsible for relief, should be taken to make certain that all children—especially those in families on relief and those in families who, though not on relief, are nevertheless in need because of unemployment—are given adequate diet, proper health supervision, and medical care. In such joint planning pedia-

tricians should be actively interested, whether in an official or nonofficial capacity. That sufficient personnel may be available to provide proper health supervision for these children, concerted effort should be made to reinforce and strengthen state, city, and county health appropriations for maternal and child health activities. The present reductions in state appropriations bear hardest on the communities that can least afford to be deprived of these activities—the smaller towns and rural areas. Such communities often have serious maternal and child health problems, and yet frequently they are the most poorly equipped to handle them.

The various efforts that have been made during the past year to strengthen regular child health activities, to reinstate certain of those that have been lost, and to provide medical care for children in families who cannot provide it for themselves should be sustained, and plans for further developments should be worked out jointly by professional and lay groups. To insure adequate diets for children, there must be not only adequate relief for those who need it, but there must be an extension of the educational aspects of the nutrition program.

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American Academy of Pediatrics

Proceedings

REPORT OF THE COMMITTEE ON HOSPITALS AND DISPENSARIES

(CONTINUED)

NURSING

An analysis of the nursing organization of the thirty-five children's hospitals in the United States and Canada has been made. Again the questionnaire method fails to give in many instances a complete picture, but in general has enabled us to secure a fairly good idea of the relative efficiencies of these various schools of pediatric nursing.

Fourteen hospitals maintain their own complete schools. As will be shown in detail later, all of these do not give complete nursing courses, but offer only a three months' course as part of a general hospital system or for affiliates from other hospitals. Among these fourteen schools of pediatric nursing only six have fifteen or more probationers. One has as high as forty-seven, but most of them are not large schools. However, twenty-eight hospitals report that they train student nurses. The number in training at any one time varies from 17 to 176. Only five institutions report 100 or more student nurses in their schools. Seventeen have less than fifty, and eight have from twenty to thirty. These figures indicate that these schools will not produce a very large number of nurses well trained in pediatric nursing.

The length of the courses varies from three months to three years, depending upon the type of school. Eleven hospitals offer a three-year course in pediatric nursing. Twenty-four offer only a three months' course, and this is usually provided for affiliates from other hospitals, or as part of a general hospital course. All hospitals except two have affiliations with other institutions for special training in pediatrics. There are four hospitals which offer pediatric training only to graduate nurses. Only seven hospitals offer a course for the training of nursery maids.

Only twelve hospitals indicate that they have special rooms or wards for premature infants. Four report that they combine the infant and premature wards; quite probably in these instances a special room is set aside for the prematures, otherwise the arrangement would certainly not be favorable for the well-being of the premature baby. Six hospitals report that they do not admit premature infants, and ten did not reply. Usually the number of premature infants receiving care at any one time is two or three. One institution reports as many as nineteen receiving care at one time. The usual nursing assignment in these wards, or rooms, is one day nurse and one night nurse for a duty term of from one to four weeks.

On the infant medical wards we note that the proportion of day nurses to patients is usually one to two or three, and night nurses one to ten or fifteen. The average number of patients in these wards is from twenty to thirty. One hospital reports a night-nurse-to-patient proportion of one to three, and one hospital as high as one to thirty-two. Unquestionably the number of nurses assigned to respective wards should depend largely upon the severity of the various illnesses on that ward

and the amount of care the patients might require. These figures represent average normal conditions and, although the questionnaire as worded could not tell us, we feel sure that in most instances the nursing force would be increased as needed.

The day assignments are in periods of from two to four weeks in eleven hospitals, and from six weeks to three months in ten. The remainder did not reply. The few replies to the question concerning the length of night assignment periods indicate that they are much shorter.

In the children's medical wards, the usual ratio of day nurses to patients is one to three or four. The night ratio is one to fifteen or twenty. The average ward cares for from thirty to forty children. However, these wards vary from sixteen to as high as one hundred patients to a ward. The day-period assignments for nurses vary considerably, but in most instances from one to three months, an assignment of three months always being in the three-year training courses. No assignment was for a longer time than three months, and only four are for that period. The day assignment is for less than one month in only six instances. Night assignments also vary considerably, but are for over four weeks in only two instances and usually are for from one to two weeks.

Only five hospitals indicate that they maintain separate surgical wards for infants. Three did not reply. The remainder combine medical and surgical wards. Three hospitals combine infants' and children's surgical wards, and four combine infants' and children's medical. These latter systems may be satisfactory if cubicle and room systems are available, but are certainly not advsiable if an open ward is used.

The ratio of nurses to patients on the surgical wards varies from one to two to from one to five during the day and from one to seven to from one to eleven at night.

Fourteen hospitals maintain separate surgical wards for older children. In this group the ratio of nurses to patients during the day varies from one to two to from one to four; during the night, from one to ten to from one to thirty-six. The last figure indicates inadequate nursing care if there are many acutely ill children on the ward.

The number of patients in the various surgical wards varies from sixteen to sixty. Only two hospitals report wards of more than forty patients, and only two have less than twenty.

The day-period assignments for the nurses vary from two weeks to four months and the night assignments, from one to four weeks.

Fifteen hospitals maintain separate wards for orthopedic cases. The majority of the other twenty institutions combine orthopedic and surgical cases on the same ward.

Among the hospitals maintaining separate orthopedic wards, the ratio of nurses to patients varies from one to three to from one to eight. The night ratio is from one to ten to from one to fifty.

Only ten hospitals maintain separate wards for special cases. Two hospitals have neurologic wards, and the others use special wards for otolaryngologic cases, tonsillectomies, etc.

Seventeen hospitals offer nurses an opportunity for training in the care of contagious diseases. A knowledge of contagious disease nursing is invaluable to any nurse expecting to care for children during her professional career (this type of training should be available in every nursing school).

Operating Room.—Operating rooms in thirty-four hospitals are in charge of experienced graduate nurses. One hospital has no surgical service. Student nurses have operating room duties in only sixteen hospitals. Two did not reply. The

number of operations performed in the respective hospitals during the fiscal year 1932-1933 varies considerably. Six hospitals report fewer than 1,000 operations for the year; seven from 1,000 to 2,000. Twelve had over 2,000; 5 over 3,000; 3 over 4,000; and one reported 11,700 operations for the year. Ten did not reply.

Diet Kitchen.—Only one hospital fails to give student nurses instruction and training in the preparation of babies' milk formulas. As a rule this training is given to groups of from two to four nurses, and the course of instruction varies from four days to six weeks. Over 50 per cent of the hospitals require at least two weeks of work in the formula laboratory; and five require one month there. Only nine hospitals limit the length of this course to one week.

A fundamental knowledge of infant foods and their preparation is necessary to a nurse expecting to work among infants and children. With exceptional teachers this knowledge possibly might be acquired in a one-week course, certainly not in a shorter time. A two weeks' course is more satisfactory if the instructors are competent.

Four hospitals fail to offer nurses training in the preparation of children's diets. Eight did not reply. Four combine this training with the formula laboratory instruction. Again we must emphasize that a sound fundamental knowledge of foods and feeding is essential to the success of any nurse expecting to do efficient children's work. A nurse's training course should always include this type of instruction.

In only nine instances are student nurses offered practical experience in the social service departments. As the majority of the pediatric training schools provide courses for affiliates only, possibly the majority of these nurses have an opportunity to obtain this type of training at some other time in their regular course in the central hospital.

Finally, we note that only ten hospitals offer to student nurses a course of training which takes them into all of three very important hospital departments: the operating room, diet kitchen and social service.

Night Duty.—A large proportion of the hospitals require a student nurse to have at least one year of training before she is permitted to do night duty. Several do not permit affiliate students on night duty, and eleven institutions require two years of training before night duty is permitted. Twelve hospitals permit night duty with less than one year of training. This fact appeared to be a discrepancy until it was found that the statement applied to affiliate students and that all of them had had one or two years of training in the central hospital before coming to the children's hospital for pediatric training.

Apparently all hospitals are careful that nurses on night duty are experienced, hence better able to meet sudden emergencies which might arise at that time.

Supervision.—Twenty-seven hospitals have graduate nurses in charge of each ward both day and night. Four permit student nurses in charge at night. Thirty-three hospitals have one or more day supervisors and a similar number at night. In each instance they are graduate nurses. Two hospitals did not reply.

In no hospital is a student nurse permitted to have day or night supervisory duties. Day supervisors in the various hospitals number from one to sixteen. Only three hospitals have more than three night supervisors. Thirteen have only one night supervisor, and ten have two.

In general the head nurses' and supervisory duties seem to be in competent hands inasmuch as they are, in most instances, handled by graduate nurses, with the exception of the four hospitals in which student nurses are in charge of the wards at night.

Miscellaneous.—Twenty hospitals offer a course in postgraduate pediatric nursing. Only nine hospitals offer student nurses an opportunity for training in an affiliated nursing school, and only one affords experience in kindergarten work. Among nurses who intend to make the care of children their life work, experience in a nursery school or kindergarten, in which the behavior patterns of normal young children may be observed and learned, we believe to be of a value equal to that of any other part of her training.

Twenty-seven hospitals use "ward helpers." These are girls who duties are confined to cleaning, care of the linen, tray carrying, scrubbing floors, and in a few instances they assist in feeding the infants and children.

Instruction of Nurses.—Table I reveals in condensed form the nursing courses offered by the respective hospitals.

TABLE I

AFFILIATE COURSE			COMPLETE COURSE (3 YR.)			PART OF 3 YR. G. H. COURSE		
HOSPITAL	LENGTH OF COURSE	LECTURE AND DEMONSTRATION HOURS	HOSPITAL	LENGTH OF COURSE	LECTURE AND DEMONSTRATION HOURS	HOSPITAL	LENGTH OF COURSE IN MONTHS	LECTURE AND DEMONSTRATION HOURS
1	3 mo.	45	2	25 mo.	599	8	3	30
2	3 mo.	?	3	3 yr.	1079	12	3	42
			4*	3 yr.	812	16	3	60
4*	3 mo.	?				17	?	40
6	4 mo.	158				10	?	36
7	3 mo.	30	14	3 yr.	982			
8	3 mo.	48	19	3 yr.	829			
9	G.H.C.		23	2 yr. 8 mo.	380	9	3 ?	18 plus
10			29	3 yr.	824			
11	3 mo.	30	30	3 yr.	843			
12	3 mo.	42	33	3 yr.	209			
13	3 mo.	20	34	3 yr.	726			
14	3-6-1 mo.	?	35	3 yr.	466			
15	3 mo.	33						
17	1 yr.?	40 ?						
18	4 mo.	45						
19	3 mo.	30						
20	3 mo.	15						
21	3 mo.	70						
22	3 mo.	?						
23	3 mo.	28						
24	3 mo.	37						
25	3 mo.	65						
26	3-4 mo.	49						
27	3 mo.	45						
28	4 mo.	80						
29	3 mo.	?						
31	3 mo.	48						
32	3 mo.	79						
33	3 mo.	24						
34	3 mo.	?						
35	6 mo.	?						

*School now discontinued.

In summarizing this chart we find that 26 hospitals offer affiliate pediatric nursing courses. Twenty-three courses are for three months; two for four months; and one is a six months' course.

Hours devoted to classroom and demonstration instruction in the three-month courses vary from fifteen to seventy-nine. The average is about thirty or forty. One four months' course devotes fifty-eight hours, the other eighty hours to this type of instruction.

One hospital offers a course in pediatric training only to graduate nurses.

Eleven hospitals offer a three-year course of training. The classroom and demonstration hours vary in these respective schools from 209 to 843. Four schools offer over 800 hours of this type of instruction; four, less than 500 hours; and three from 500 to 800 hours.

Special Information.—Measures to prevent cross-infection such as a separate thermometer, towel, and wash cloth for each infant and child are in general use. Four hospitals do not use separate thermometers for the older children.

Twenty-one hospitals require nurses to wear a separate gown in handling each baby and the majority use a cubicle rotation system, together with special gowns, masks, careful scrubbing of hands, and the use of antiseptic solutions. Several institutions require all physicians, nurses, and hospital help to wear masks during the winter months. One requires this precaution only on the infant wards. Several prohibit bedside visiting at all times, and few permit exchange of toys from bed to bed.

Bedside visiting is a problem in all hospitals. Patients probably would have much greater protection if it could always be prohibited.

Dispensary Nursing.—Among the thirty-four hospitals having dispensaries, thirty have a head nurse in charge of the entire dispensary. One has a supervisory nurse, and three did not reply. Twenty-three have supervisory nurses as well as a head nurse. One dispensary has thirteen supervising nurses. Twenty have from one to five.

Fourteen dispensaries employ graduate nurses in addition to the head and supervising nurses. Fifteen do not, and six did not reply. One dispensary employs thirty-four graduate nurses. The average number is from one to five. Twenty-five dispensaries offer training for student nurses; six do not. One did not reply.

Sixteen offer postgraduate instruction in dispensary work.

Only ten hospitals afford the nurses an opportunity for home visiting, but the majority of the thirty-five hospitals have affiliations with the visiting nurse association, the public health service, or the social service for home visiting work, if it is desired.

Only three hospitals indicate that student nurses do not have dispensary duties. Six did not reply. The number of student nurses on duty at any time in the respective dispensaries varies considerably, from one to ten. Eighteen have from three to six. Only five have over six.

In most instances the dispensary service is for a period of from two to four weeks. Of the hospitals having three-year courses, five require two months on the dispensary service.

Experience in all departments of the dispensary is given in twenty hospitals. Only 50 per cent of the nurses have it in one hospital, and 33 per cent in another. One does not offer this service to affiliates. Seven did not reply.

Three indicate that nurses are not given experience in all departments of the dispensary.

Nurses do home visiting in only fourteen hospitals. Six did not reply. Usually this is for follow-up of a case, rarely for nursing care. The length of time spent on this service is usually short (from one day to one week). Eleven hospitals report

no home visiting during the last fiscal year. Among the remainder, the number of home visits made varies from 52 to as high as 47,000 for the year. Only five report less than 1,000 visits.

CONCLUSIONS

Only eleven hospitals in this country and Canada offer a three-year course in pediatric nursing, and the total number of students trained by these schools is not large. It naturally follows that there are comparatively few nurses available in this country who have had comprehensive training in the care of infants and children. Of course, twenty-four children's hospitals offer three months' courses which are available to affiliates from other hospitals and to students of general hospital nursing schools of which the children's hospital may be a unit. However, three months is probably too short a time in which to expect a student to acquire well-rounded pediatric training. In view of the fact that so many general hospitals take advantage of the possibility of pediatric training for their nurses in children's hospitals, it is all the more important that these hospitals should demand a course of training adequate to meet the needs. And in view of the fact that so many of the general hospitals have inadequate facilities for caring for children, it seems altogether likely that the number of nurses capable of doing good pediatric nursing must be minimum. In this report it is very interesting to note that only four of the children's hospitals offer pediatric training to graduate nurses. This is certainly a misfortune since there is practically no other place for nurses to obtain graduate work in pediatrics. The training of nursery maids is not so important, but it is surprising that only seven of the hospitals see fit to offer it.

To determine the correct number of hours in a nursing course which should be devoted to classroom and demonstration instruction, and thereby set a standard, is difficult. Much depends upon the efficiency of the instructors and the relative intelligence and previous training of the student. Most probably three-month courses should offer at least from twenty-five to thirty hours of that type of instruction. Instruction in nutrition, development, and the nature of disease in children preferably should be done by the staff physicians. Eight hundred hours of classroom and demonstration instruction is not too much for a three-year course. (Possibly five hundred hours or less is too little?)

The proportionate number of nurses assigned to day and night duty on wards varies considerably with the respective hospitals. In most instances there seems to be an adequate number of nurses for efficient care of the patients, particularly during the day. In a few instances there may be some question whether there are a sufficient number of night nurses employed. Night assignments are usually and should be for a comparatively short period.

In general the number of patients on any one ward is not large. We note only two hospitals report wards having more than 40 patients.

Less than one-half of the hospitals maintain separate wards for orthopedic cases, and one-third have separate wards for special cases, such as neurologic, otolaryngologic (tonsillectomies), etc.

Only one-half of the hospitals offer contagious disease training for nurses, but in many instances this training is available only by affiliation or special courses in contagious disease hospitals in the same city.

The operating rooms of the various hospitals are all in charge of graduate nurses. How efficient they may be, the questionnaire cannot tell us. However, eighteen hospitals afford no operating room duty to student nurses. This fact, of

course, is an indication of an efficient nursing force in the operating room, but does not necessarily mean that the use of student nurses in operating room work means inefficiency there.

Among the thirty-four hospitals maintaining operating rooms, it is interesting to note thirteen listed fewer than 2,000 operations for the fiscal year 1932-1933. Ten hospitals did not reply to this question, and if they had, possibly over one-half of these hospitals could have fallen in that group.

Nursing supervision in all (thirty-three) hospitals replying to this question is in the hands of graduate nurses, as it should be. This applies to both day and night duty.

Apparently most of the children's hospitals are not alert to the importance of the training of nurses in normal child psychology and behavior. Comparatively few afford the student nurses experience in kindergarten or nursery school work.

Special precautions to prevent cross-infection are generally in force in all hospitals, some being more careful in this respect than others; these in particular require all persons in contact with the patients during the winter months to wear masks.

The failure of so many children's hospitals to offer social service work to nurses in training is to be deplored since much of the work among children for graduate nurses is of a public health nature, and a knowledge of social service is invaluable.

Dispensary nursing service seems to be adequate in most instances. Several hospitals fail to give their pupils training in all departments of the dispensary. Home visiting is carried out in only fourteen hospitals, and among these several report relatively few home visits made during the last fiscal year.

Comments

FOR many years the work of the National Board of Examiners has been of interest and importance to every one involved in the field of medical education. In 1933 over 550 graduates took the final (Part III) examination for a certificate, or approximately one-tenth of the total applicants for licensure in the United States in that year. Every one has the highest respect for the purposes and character of the Board and its methods of work. It is difficult, however, to understand the attitude of the Board toward the subject of pediatrics, unless it is perhaps that the Board has been so involved in the technic of the work that it has failed to keep pace with and grasp some of the significant changes and trends in medical education and practice of recent years.

The position and place of pediatrics in undergraduate medical education has been steadily changing during the years the National Board of Medical Examiners has been in existence. While twenty years ago it was, as a whole, a subdepartment of medicine, the position of pediatrics has changed until medical educators today regard it as one of the four basic branches of clinical medicine, and in over 90 per cent of our medical schools independent departments have been organized of equal academic rank and importance to those of medicine, surgery, and obstetrics. The National Board of Medical Examiners has failed to take cognizance of this change and development and still dismisses pediatrics with a couple of questions included in the examination in medicine. It was only three years ago, after considerable pressure, that a pediatrician was added to the Board who could give some advice as to the character and scope of these questions.

It is difficult to grasp the logic of the reasoning of the Board which considers pediatrics as a specialty. First of all this is quite contrary to the situation which exists in our medical schools. Despite the fact that those most deeply concerned in medical education regard it and give it the position of a basic subject, the Board arbitrarily takes the stand that it is a specialty.

It has been said that the examination of the newly formed American Board of Pediatrics takes care of the matter of a special examination for pediatrics. This is loose and incorrect thinking. The examination of the National Board of Medical Examiners covers undergraduate medical instruction. Its purpose is to ascertain if the general basic medical training is sound and qualifies the individual to enter into the general practice of medicine. The examination of the Board of Pediatrics is to ascertain if the individual has sufficient specialized training and specialized knowledge to practice pediatrics as a specialist. If the National Board of Examiners is consistent in this attitude, we do not see how they can continue to hold a separate examination in obstetrics, as exactly the same situation exists here as in the case of pediatrics. A moment's thought as regards another of the basic clinical subjects, surgery, shows this viewpoint to be illogical. The National Board of Examiners holds a separate examination in surgery. Does it mean that they believe a fourth-year medical student who passes this examination is qualified to go out and perform major operations? This we are sure is furthest from their thoughts. The scope of this examination covers the basic principles of surgery and not surgery as a special-

ized therapeutic technic. This is what is needed for pediatrics, not a "specialist" examination, but an examination which covers pediatrics as taught in the medical school as one of the four basic clinical subjects of instruction.

We feel that the attitude of the National Board of Medical Examiners lies chiefly in its failure to keep abreast of the changes and trends in medical thought and in undergraduate medical education. The situation should be remedied and a separate examination in pediatrics should be instituted by the National Board of Medical Examiners.

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